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An Improved Mercury Column.

BY D. N. MELVIN.

A PAPER READ BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Every one who is in any way familiar with the generation and use of steam at high pressure, knows well the unreliable nature of the ordinary spring pressure gauge or manometer.

On this account resource is sometimes had to the open mercury column, where the pressure is not so high as to entail the erection of a very high siphon.

On many of our steamers the mercury column is still used in conjunction with the spring gauge, principally to check the accuracy of the latter. Even the so-called test gauges, manufactured specially as standards, require to be tested periodically with a mercury column; and for this purpose, numbers of firms have at considerable expense erected open mercury columns for high pressures.

The object of this paper is to show how the open mercury column can be brought into more general use at a comparatively small cost, as a standard test gauge where spring gauges are in use, without the necessity of erecting a high unwieldy siphon, or in fact making any special arrangements whatever, even for the highest pressures.

About five years ago the writer, being very much annoyed by the discrepancy between a number of spring gauges he had in use, determined to erect an open mercury column, but the great height required, and the unwieldy nature of the instrument, induced him to seek for some method of bringing the whole apparatus within moderate bounds.

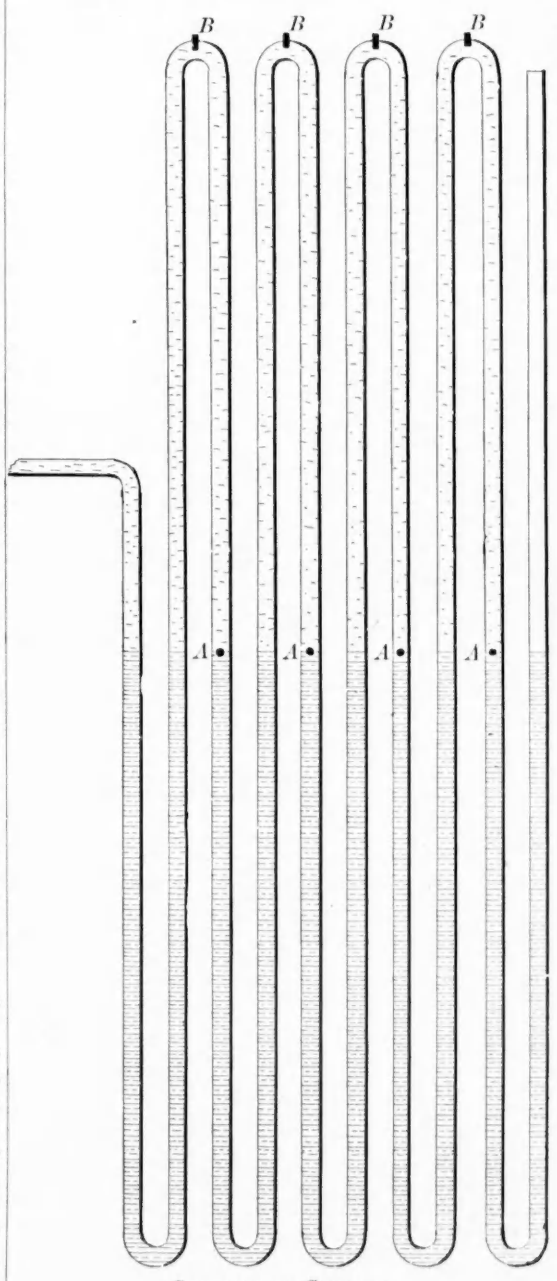
That well-known artifice employed by Fahrenheit for reducing the height of the barometer seemed to offer the means, and on investigation it was found that this artifice had already been employed for this purpose under the name of the "Differential Manometer," and it is described in Deschannel's Natural Philosophy, and also in Weisbach's Mechanics of Engineering, Vol. 2.

Although several attempts have been made by parties to introduce this device, yet it has not come into general use; probably because of the difficulties attendant on filling the tubes, and also on the expansion by increase of temperature becoming more apparent than in a single siphon, the whole elongation of the contents being transmitted to the outer ends; and as the readings have been taken from the elevation of the mercury in the last tube, they would necessarily be very inaccurate. By simply constructing the scale to read the difference of level in the two outer tubes, the effects of expansion by increase of temperature in this way is counteracted, leaving only the actual decrease of specific weight to be taken into account, as in a single siphon gauge.

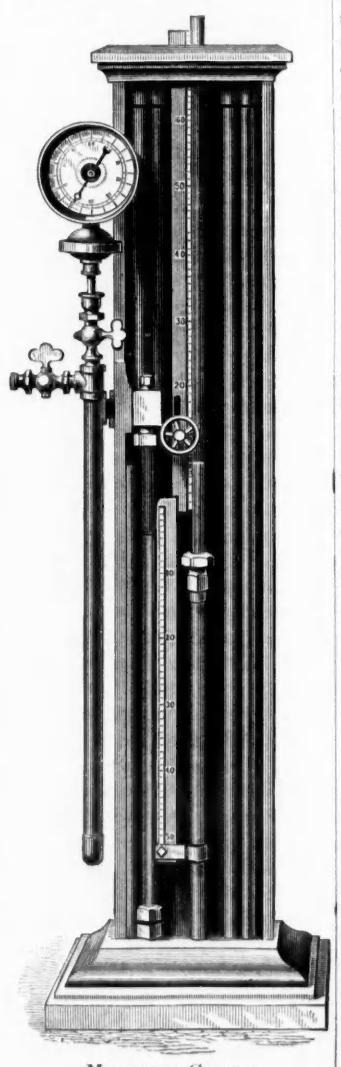
On calculating the effect of different liquids used in conjunction with mercury, it became apparent that the whole of the effects of expansion could be eliminated, and the instrument rendered accurate at all temperatures within ordinary range.

The diagram represents a gauge with five siphons, the siphons being spread out on the plane of the paper instead of in a square nest; and the engraving shows the same gauge as in use.

The lower parts of the tubes are filled with mercury up to the holes *A*, *A*, *A*, *A*. These holes are then plugged with taper-screw plugs, and made perfectly tight; the top parts of the tubes are then filled with some other liquid of known specific gravity and co-efficient of expansion, through the holes marked *B*, *B*, *B*, *B*. These holes are in turn plugged, and the gauge is ready for use.



SECTIONS OF SIPHONS.



MERCURY GAUGE.

Upon the application of pressure to the first column it is depressed a certain amount, the pressure is transmitted through the second liquid in the upper parts of the siphons, and all the other columns are depressed the same amount, provided the tubes are all of uniform bore.

If the second liquid merely transmitted the pressure without of itself possessing weight, the height of a single column of mercury, equivalent to the pressure, would be the sum of the differences of level in each of the siphons; but the weight of the column of the second liquid is added to the pressure, so that the sum of the differences is too great by this amount, therefore this has to be deducted, and the formula stands as given in the text books—

Equivalent height of single mercury column $\Big\} = nd\left(1-\frac{1}{13.59}\right)$ or by common arithmetic, number of siphons $\times$ difference of level $\times\left(1-\frac{1}{13.59}\right)$ where n is the number of siphons, and d the difference of level; 13.596 being the specific gravity of mercury. Water is here used as the second liquid, and consequently unity is the numerator of the fraction; and if any other liquid is used, its specific gravity must be substituted in the numerator.

Any increase of temperature expands the contents of the tubes; this expansion is transmitted to the outer ends of the siphons, and if the bore of the tubes is uniform, the surfaces of the mercury in the two outer tubes are unequally elevated above their original position, and the difference of height between the surfaces of mercury, or the height of the column, becomes increased with every increment of temperature; but as the second liquid also becomes lighter, the total pressure on the mercury becomes less.

The correction for temperature then depends on the relative densities of the two liquids, as well as on the actual expansion of mercury. The above formula will give the equivalent height of a mercury column at any temperature, if the specific gravities or densities of the two liquids at the desired temperature are substituted in the minus quantity. If this ratio, or the relative densities of the two liquids remained the same as the temperature increased, then the correction would be the same as in a column of mercury of the same height; but, if this ratio increased with every increment of temperature as the specific gravity of mercury decreased, or, in other words, if the second liquid were to lose as much specific weight as mercury did by increase of temperature, then the actual height of the column (*i. e.*), the difference of level between the surfaces of mercury would remain the same, and these surfaces would be equally elevated above their original position, whatever variations of temperature might take place.

To accomplish this it is only necessary to select for a second liquid a substance whose specific gravity, multiplied into its co-efficient of expansion, is equal to the specific gravity of mercury multiplied into its co-efficient of expansion; or whose density will decrease with each increment of temperature at the same rate as the density of mercury decreases.

This is shown in the table on page 2, in which the variation of a 30″ column on a five siphon gauge is shown, both for water and tetrachloride of tin used as second liquids. I have chosen tetrachloride of tin to illustrate with, as its decrease of density, with increase of temperature, is rather greater than that of mercury, causing the column actually to shorten as the temperature rises, as will be seen by inspection of column 3. From columns 5 and 7 it will be seen that the decrease in specific gravity of mercury and tetrachloride of tin is nearly the same, and if they had been exactly alike, the height of the column, or the reading height of the gauge, would have remained constant as the temperature varied.

The specific gravities of mercury are taken from the tables of Regnault, and those of tetrachloride of tin are calculated by the aid of the formula of Pierre.

The photograph, from which the accompanying engraving was made, is taken from a gauge the writer has had in constant use for the last four years. The second liquid used was a mixture of salt water and glycerine, and it has answered the purpose admirably; and being compact, it could easily be kept at a constant temperature.

Dr. Andrews, of Queen's College, Belfast, in a paper read before the Royal Society, says: "It is with regret I am still obliged to give the pressures in atmospheres, as indicated by an air, or hydrogen manometer, without attempting for the present to apply the corrections required to reduce them to true pressures. The only satisfactory method of obtaining these corrections would be to compare the indications of the manometer with those of a column of mercury of the required length. * * * For pressures corresponding to 500 atmospheres, at which I have no difficulty in working with my apparatus, a mercurial column of the enormous height of 1,250 feet would be required. Although the mechanical difficulties, in the construction of a long tube for this purpose, are, perhaps, not insuperable, it could only be mounted in front of some rare mountain escarpment, where it would be practically impossible to conduct a long series of delicate experiments.

Here, then, is an instrument, which would

1	2	3	4
Temperature. Cent.	Height of Column, with Water as Second Liquid.	Height of Column, with Chloride of Tin as Second Liquid.	Specific Gravity of Mercury.
0°	30.00000	30.00000	13 59600
10°	30.05420	29.99057	13.57167
20°	30.11050	29.99937	13.54736
30°	30.16050	29.99010	13.52405
40°	30.21465	29.98642	13.49895

	5	6	7
Temperature. Cent.	Difference of Spg. of Mercury.	Specific Gravity of Chloride of Tin.	Difference of Spg. of Chloride of Tin.
0°	.0244	2.2671	.0256
10°	.0243	2.2415	.0255
20°	.0233	2.2160	.0254
30°	.0251	2.1906	.0258
40°		2.1648	

accomplish all this; and if no greater height could be allowed, 100 siphons of 15 feet each would test up to 500 atmospheres easily.

Second Regular Meeting of the American Society of Mechanical Engineers.

The first regular session for 1881 of the American Society of Mechanical Engineers was held, according to programme, in the Common Council Chamber, City Hall Building, Hartford, Conn., at 8 P. M., Wednesday, May 4th. Among those present at the opening session were:

Prof. Robert H. Thurston, President, Hoboken, N.J.
James Brady, Brooklyn, N. Y.
Oberlin Smith, Bridgeton, N. J.
Geo. H. Smith, Providence, R. I.
E. H. Parks, Providence, R. I.
Stephen W. Baldwin, 110 Liberty St., New York City.
J. Sellers Bancroft, William Sellers & Co., Philadelphia, Pa.
George A. Barnard, Coal and Iron Exchange, New York City.
James C. Bayles, 83 Reade St., New York City.
Charles E. Billings, Billings & Spencer Co., Hartford, Conn.
C. H. Brown. C. H. Brown & Co., Fitchburg, Mass.
Wm. Lee Church, Hartford Engineering Co., Hartford, Conn.
Alfred B. Couch, 1509 Centennial Avenue, Philadelphia, Pa.
David P. Davis, P. O. Box 167, 33 Madison Av., Jersey City, N. J.
W. F. Durfee, 89 Cortlandt St., Bridgeport, Conn.
Prof. Thomas Egleston, Columbia College, New York City.
Charles E. Emery, 16 Cortlandt St., New York City.
Col. Levi K. Fuller, Brattleboro, Vt.
Edward Le Breton Gardiner, Dundee Water Power Co., Passaic, N. J.
Alex. Gordon, Niles Tool Works, Hamilton, Ohio.
Fred. W. Gordon, 173 Wood St., Pittsburgh, Pa.
John J. Grant, Pratt & Whitney Co,, Hartford, Conn.
William E. Barrows, Willimantic Linen Co., Hartford, Conn.
William H. Harrison, Newcastle, Pa.
Gustavus C. Henning, Wilmington, Del.
Wm. Hewitt, Trenton Iron Co., Trenton, N. J.
D. S. Hines, 239 Broadway, New York City.
J. C. Hoadley, 29 High St., Boston, Mass.
Alexander L. Holley, 239 Broadway, New York City.
George M. Holmes, P. C. Holmes & Co., Gardiner, Me.
Charles P. Howard, James L. Howard & Co., Hartford, Conn.
Prof. Frederic R. Hutton, 6 W. 33d St., New York City.
E. D. Leavitt, Jr., 127 Magazine St., Cambridgeport, Mass.
Lewis F. Lyne, AMERICAN MACHINIST, 96 Fulton St., New York City.
Wm. Mason, Colt's Armory, Hartford, Conn.
Edward J. Murphy, Colt's Armory Hartford, Conn.
A. F. Nagle, Thompson & Nagle, Providence, R. I.
Wm. H. Odell, Yonkers, N. Y.
E. G. Parkhurst, Pratt & Whitney Co., Hartford, Conn.
Francis A. Pratt, Pratt & Whitney Co., Hartford, Conn.
Thomas Whiteside Rae, Secretary, 239 Broadway, New York City.
Jackson Bailey, AMERICAN MACHINIST, 96 Fulton St., New York City.
Charles B. Richards, 430 Washington Av., Philadelphia, Pa.
Francis H. Richards, Richards & Dole, Springfield, Mass.
Joshua Rose, P. O. Box 3306, New York City.
C. E. Simonds, East Boston, Mass.
S. N. Hartwell, Hartford, Conn.
Allan Stirling, Drifton, Jeddo P. O., Luzerne Co., Pa.
George S. Strong, Kelly & Ludwig, 720 Filbert St., Philadelphia, Pa.
Samuel Webber, Manchester, N. H.
W. H. Weightman, 85 Astor House, New York City.
Joseph J, White, H. B. Smith Machine Co., Smithville, Burlington County, N. J.
Moses G. Wilder, 55 Boerum Place, Brooklyn, N. Y.
Alfred R. Wolff, 85 Astor House, New York City.
C. J. H. Woodbury, 131 Devonshire St., Boston, Mass.
Gardner C. Hawkins, 36-38 Oliver St., Boston, Mass.
Horace B. Miller, AMERICAN MACHINIST, 96 Fulton St., New York City.
Prof. Geo. J. Alden, Mechanics' Free Institute, Worcester, Mass.
Thomas R. Almond, 84 Pearl St., Brooklyn, N. Y.
Thomas L. Churchill, 131 Devonshire St., Boston, Mass.
Lycurgus B. Moore, AMERICAN MACHINIST, 96 Fulton St., New York City.
Louis G. Laureau, New York City.
Charles P. Deane, Deane Steam Pump Works, Holyoke, Mass.
Col. Levi K. Fuller, Brattleboro, Vt.
Milton P. Higgins, Washburn Machine Shop, Worcester, Mass.
H. A. Hill, 36 & 38 Oliver St., Boston, Mass.
Horace Lord, Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
David N. Melvin, Linoleumville, Staten Island, N.Y.
Edward J. Murphy, Colt's Armory, Hartford, Conn.
Samuel W. Powell, South Boston Iron Co., 57 Foundry Co., Boston, Mass.
Richard H. Soule, N. C. and B. & P. Railroads, Baltimore, Md.
Edward W. Thomas, Willimantic, Conn.
Jerome Wheelock, Worcester, Mass.
S. B. Whiting, Phila. & Reading Coal and Iron Co., Pottsville, Pa.
Holbrook F. J. Porter, Delamater Iron Works, West 13th St., New York City.
Charles Sperry, Westbrook, Conn.
Edward N. Trump, Delaware Beet Sugar Co., Wilmington, Del.

Among the invited guests present were the following:

Sidney Gilchrist Thomas, of England.
Rev. Dr. Twitchell, Hartford, Conn.
N. C. Stiles, Middletown, Conn.
Dwight Slate, Hartford, Conn.
A. S. Cook, Hartford, Conn.
W. E. Partridge, New York City.
J. M. Allen, Hartford, Conn.
Ex. Gov. Holley, of Connecticut.
Prof. Charles J. King, Madison, Ill.

President Thurston called the meeting to order, and introduced Mr. De Witt C. Pond, of Hartford, President of the Common Council of that city.

Mr. Pond said: Mr. President and Gentlemen of the American Society of Mechanical Engineers—In the absence of His Honor, the Mayor, whose illness renders it impossible for him to be present here this evening, the duty devolves upon me (in this case a very pleasant one), as President of the Board of Aldermen, to extend to the members of your Society a hearty greeting and welcome to this, our city. In conformity to a resolution, passed unanimously by both branches of the Court of Common Council, we extend the free use of the Common Council Chambers in this building, and also the committee rooms attached, for the annual meeting of your Society. That your sessions may be harmonious and profitable, and the occasion of new and pleasant relations, both among the members of the Society and the citizens of our city, is the wish and desire of all.

The Chairman: In behalf of the Society, sir, I take great pleasure in expressing to you our gratitude for the privileges that you have accorded us, and to say that we have come to Hartford, among other reasons, because we expected just such hospitality. We have also come to Hartford, expecting various other things. We thought it would be a safe place to come to, for we knew that life insurance was here carried to such an extent that we were absolutely safe in making a visit to Hartford. You must remember, sir, that the members of our Society are extremely busy just now. I presume no association contains so large a proportion of men who are tied to business as the members of this Society, and, therefore, that we have so large a gathering seems to me somewhat remarkable, and I attribute it very largely to that fact.

We have also come to Hartford because of sundry business reasons—to find how certain things are done. We find this is the place where they are done well, perhaps best, and we are sure of drawing away a large amount of business from your town. And we are sure of our pay, too, if we succeed in getting that business, because we know that in a town of 40,000 or 50,000 inhabitants, having $50,000,000 capitalized in its banks, there will be no trouble in getting our money.

The Chairman then addressed the society as follows:

Gentlemen of the Society: I have the pleasure of calling the first regular meeting of 1881, and have to say that, since our last meeting, the growth of the Society has been something very remarkable. We have on our list now 250 or 260 names, 66 of which have come in since the last meeting of the Society; and when we consider the fact that the Society is, to-day, hardly a year old—for its life will date from its first regular meeting of last November—our success in creating a nucleus and gathering in so many men of our profession, is, I think, very remarkable, indeed, and the Society is to be congratulated.

The report of the Treasurer, which will be read presently, will show you that the finances of the Society are in an equally encouraging condition. The amount that has been received from annual dues and initiation fees amounts to over $5,000, and the Treasurer has so managed things, with the assistance of the Secretary, in economizing, as to have left on hand about $3,500, which he has now in bank; and the long list of new names which will be voted in this evening will supply funds for paying, I presume, all bills outstanding, so that the financial condition of the Society is as encouraging as is its membership.

We have a long list of papers, some of which will probably call for a considerable amount of debate, and for that reason it is advisable to push through the preliminary business that will come before us as rapidly as possible. Therefore, without any further preliminaries, I will call for the general or regular business of the meeting. The first thing in the regular order of business, I presume, will be to hear the Treasurer's report.

The treasurer, Lycurgus B. Moore, then read his report, the essential portions of which we give below:

Total Receipts	$5,217.00
Total Expenditures	1,808.47
Balance on hand	$3,408.53

Of this amount $447.78 is in cash, and $2,960 in United States 4 per cent. bonds. There is still due the society $356 for initiation fees and dues (not counting dues from newly-elected members.)

The following new members were unanimously elected:

MEMBERS.

Captain John Ericsson, 36 Beach St., New York City.
Erastus W. Smith, 177 West St., New York City.
J. Vaughan Merrick, Philadelphia, Pa.
Samuel McElroy, 336 Fulton St., Brooklyn, N. Y.
John Alexander, Mechanical Superintendent Standard Oil Co., 140 Pearl St., New York York City.
Stephen B. Babcock, Superintending Engineer Troy Steam Heating Company, Troy, N. Y.
George H. Barrus, 87 Milk St., Boston, Mass.
John W. Cloud, Altoona, Pa.
Alfred Colin, 341 Madison Avenue, New York City.
James E. Denton, Stevens Institute of Technology, Hoboken, N. J.
W. J. M. Dobson, Mechanical Sup't. McKesson & Robbins' Chemical Works, 91 Fulton St., N. Y. City.
John Fritz, General Superintendent Bethlehem Iron Works, Bethlehem, Pa.
Robert Forsyth, Superintendent North Chicago Rolling Mill, Chicago, Ill.
H. P. Gregory, San Francisco, Cal.
S. N. Hartwell, 43 Pratt St., Hartford, Conn.
John T. Henthorn, Corliss Steam Engine Company, Providence, R. I.
William Cleveland Hicks, 19 Park Place, N. Y. City.
C. C. Hill, 84 Market St., Chicago, Ill.
Joseph J. Illingworth, Chief Engineer Utica Steam Cotton Mills, Utica, N. Y.
Daniel N. Jones, Chief Engineer Cambria Iron Works, Johnstown, Pa.
Henry C. Jones, Hilles & Jones, Wilmington, Del.
William R. Jones, General Superintendent Edgar Thompson Steel Works, Pittsburgh, Pa.
Louis G. Laureau, 239 Broadway, New York City.
William A. Leavitt, 2032 North 22d St., Philadelphia, Pa.
Alexander Miller, Delamater Iron works, N. Y. City.
Charles H. Morgan, Superintendent Washburn & Moen Manufacturing Company, Worcester, Mass.
James Park, Jr., Black Diamond Steel Works, Pittsburgh, Pa.
Theodore H. Risdon, Mount Holly, N. J.
Oberlin Smith, President Ferracute Machine Company, Bridgeton, N, J.
Horace S. Smith, General Superintendent Joliet Steel Works, Joliet, Ill.
Henry F. Snyder, Pardee, Snyder & Co. Watsontown, Pa.
Frank G. Tallman, Corliss Steam Engine Company, Providence, R. I.
James Thomas, Davies & Thomas, Catasauqua, Pa.
Samuel S. Welman, Manager Ohio Iron and Steel Company, Cleveland, Ohio.
William Oliver Webber, Superintendent Allen Paper Car Wheel Co. Pullman, Ill.

ASSOCIATE.

W. H. Bailey, American Tube Works, 78 John St., New York City.

The secretary announced that the society had voted upon the following resolution, by ballot, thus: Ayes, 111; Noes, 24; Total vote, 135.

Resolved, That the society deprecate any legislation tending to make obligatory the introduction of the Metric System of measurement into our industrial establishments. Also, that the Secretary be instructed to communicate the sentiments of this resolution to any one concerned in procuring such legislation. And further, that a copy of this resolution be sent to the Anti-Metric Society, of Cleveland, Ohio.

Mr. Durfee gave notice of an intended motion to amend Article 38 of the Rules, requiring proofs of all papers and discussions upon them to be sent to the author, and to persons taking part in the discussion, for revision, before publication. The first paper was then read by Prof. R. H. Thurston, entitled, "Ratio of Expansion at Maximum Efficiency," which was followed by a similar paper prepared by Alfred R. Wolff and James E. Denton, on "The Most Economical Point of Cut-off in Steam Engines." Both papers were discussed at length by Messrs Emery, Leavitt, Durfee, Stirling, Thurston, Wolff, and others, occupying the remainder of the evening session.

At the Thursday morning session, discussion of the papers presented on the previous evening was continued, by Messrs. Harrison, Leavitt, Durfee, Hutton, and Thurston.

A paper was then read by E. D. Leavitt, Jr., entitled "The Superior;" and discussion took place by Messrs. Hill, Stirling, C. E. Emery, Henning, Holley, Oberlin Smith, and A. Davis.

Charles E. Emery then read two papers; one entitled, "Alterations to the Cross Head of a Corliss Engine," which was discussed by Messrs. Leavitt, Strong, and Emery; and the second, on "Experiments with Non-Conducting Coverings for Steam Pipes," which was discussed by Messrs. Durfee, Fuller, Woodbury, Stirling, and Egleston.

The fourth paper was entitled "Formula for Belt Power," by A. F. Nagle; discussed by Messrs. Thurston and Emery.

A memorandum, regarding a new method of preparing drawings, was next presented by Prof. S. W. Powel, and discussion ensued by Messrs. Thurston, Leavitt, and Durfee.

At the afternoon session, a paper was read by Sam'l Webber, entitled "Experiments on the Adhesion of Leather Belts," which was discussed by Messrs. Alden and Nagle. A paper entitled "The Binary Absorption System of Ice Machinery," was then read by Holbrook F. J. Porter, on which there was no discussion. Lewis Johnson's paper, entitled "A Brief Treatise on the Steamboat Cam," was next read, followed by the paper of Wm. Hewitt, entitled "The Continuous Rod Mill of the Trenton Iron Company," on which a lively discussion ensued by Messrs. Stirling, Leavitt, Thurston, Baldwin, Wheelock, C. B. Richards, C. E. Emery, Nagle and Hoadley.

Before adjournment, under a suspension of the rules, reached by unanimous vote, Mr. Holley moved an amendment to Article 13 of the Rules, which was passed unanimously, giving the Council authority to open ballots cast for the various grades of membership, and inform newly-elected candidates of their election in time to enable them to be present at the meetings, and to add their names to the catalogue. Had such a rule been earlier in force, the present long list of newly-elected members would have felt less hesitation about being present at this meeting.

Attention was called by Lewis F. Lyne to the need felt by many of the new members of an "Introducing Committee," whose business should be to make the members of the society better acquainted with each other, and the Standing Committee on Rooms and *Conversazione* were reminded that this feature formed a part of their especial duties.

In the evening, members and invited guests to the number of about sixty-five, assembled for a social dinner, the expenses of which were met by subscription among the members. In the course of the evening, pleasant and suggestive speeches were made

by Messrs. Pond and Barber on behalf of the city of Hartford, by Sidney Gilchrist Thomas, on behalf of the Iron and Steel Institute of Great Britain, and by Messrs. Leavitt, Egleston, Holley, Emery, Bayles, Raymond, and Thurston. At the close of Mr. Rossiter Worthington Raymond's remarks a beautiful tribute was paid to the memory of the greatest hydraulic engineer of the century, Henry Rossiter Worthington, for whom the speaker was named, and this tribute was effectively seconded by Messrs Leavitt and Emery.

The programme for Friday included visits in a body to the establishments of The Pratt & Whitney Co., The Hartford Machine Screw Co., The Billings & Spencer Co., Colt's Patent Fire Arms Manufacturing Co., and the Hartford Engineering Co.

At the Friday evening session, several papers were read, followed by a resolution of thanks to the city and citizens of Hartford, for the free use of the Common Council Chamber, and many other courtesies.

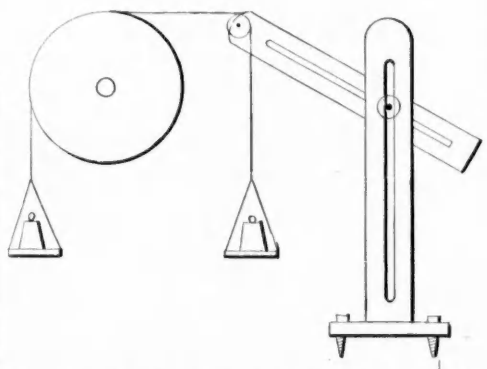
These resolutions were offered by Lycurgus B. Moore, Treasurer of the Society, were seconded by J. C. Hoadley, and passed by unanimous vote, after which the Society adjourned until the next regular meeting.

Experiments on the Adhesion of Leather Belts.

BY SAMUEL WEBBER.

A PAPER READ BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

The following experiments have been made with the view of adding somewhat to our actual stock of knowledge of the adhesion of leather belts to smooth cast iron pulleys, at different arcs of surface contact, and although not as complete as might be wished, go far to show that the adhesion is as the arc of contact, without reference to the diameter of the pulley.



EXPERIMENTS ON FRICTION OF BELTS AT DIFFERENT ANGLES OF CONTACT ON PULLEYS OF DIFFERENT DIAMETERS AND WITH DIFFERENT CONDITIONS OF BELT.

	Old 3-inch Belt—moist and soft—March 10, 1881.						Same Belt—more dry, April 2, 1881.			New Belt—April 2, 1881.		
	Pulley 36-in Diam.			Pulley 18-in. Diam.			Pulley 24-in. Diam.			Pulley 24-in. Diam.		
Angle 90°	Wt. Light End.	Wt. H'v'y End.	Wt. Held.	Wt. Light End.	Wt. H'v'y End.	Wt. Held.	Wt. Light End.	Wt. H'v'y End.	Wt. Held.	Wt. Light End.	Wt. H'v'y End.	Wt. Held.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
	21.75	34.	12.25	21.75	34.	12.25	21.75	31.50	9.75	21.75	31.	9.25
	30.25	45.75	15.50	29.75	43.75	14.	31.25	47.25	16.	35.	48.	13.
	45.75	67.75	22.	43.75	66.50	22.75	44.75	65.	20.25	53.	71.	18.
	55.75	84.75	29.	52.3	85.	32.25	52.75	76.	23.25	52.75	70.25	17.50
	72.50	107.25	34.75	70.75	105.25	34.50	69.75	100.75	31.	70.75	92.75	22.
Totals	226.	339.50	113.50	218.75	334.5	115.75	220.25	320.50	100.25	233.25	313.	79.75
Averages =	45.20	67.9	22.70	43.75	66.90	23.15	44.05	64.10	20.05	46.65	62.60	15.95
Angle 130°	21.75	37.75	16.									
	29.75	50.25	20.50									
	44.25	74.	29.75									
	52.75	91.	38.25									
	70.25	118.	47.75									
Totals	218.75	371.	152.25									
Averages =	43.75	74.20	30.45									
Angle 180°	25.	53.25	28.25	21.75	48.	26.25	21.75	44.25	22.50	21.75	37.50	15.75
	35.25	69.25	34.	36.25	79.	42.75	30.25	59.25	29.	30.25	52.25	22.
	41.75	84.25	42.5	44.75	97.	52.25	44.75	84.75	40.	44.75	73.75	29.
	46.75	93.	46.25	52.75	114.	61.25	52.75	99.25	46.50	52.75	85.75	33.
	70.25	134.75	64.50	69.75	142.25	72.50	69.75	130.25	60.50	69.75	108.75	39.
Totals	219.	434.50	215.50	225.25	480.25	255.	219.25	417.75	198.50	219.25	358.	138.75
Averages =	43.80	86.90	43.10	45.05	96.05	51.	43.85	83.55	39.70	43.85	71.60	27.75
Angle 220°	23.25	54.75	31.50									
	29.75	71.50	41.75									
	44.25	105.	60.75									
	52.75	120.25	67.50									
	69.75	165.75	96.									
Totals	219.75	517.25	297.50									
Averages =	43.95	103.45	59.50									
Angle 270°	21.75	89.75	68.									
	33.50	116.25	82.75									
	44.25	147 25	103.									
	62.75	196.25	133.50									
Totals	162.25	549.50	387.25									
Averages =	40.56	137.37	96.81									
Angle 270° Same belt as used on 24-in Pulley.	21.75	76.	54.25									
	30.25	103.75	73.50									
	44.75	138.50	93.75									
	52.75	161.25	108.50									
	63.75	188.50	124.75									
	70.75	205.25	134.50									
Totals	284.	873.25	589.25									
Averages =	47.33	145.54	98.21									

This matter has been previously ascertained, so far as the different sizes of pulleys are concerned, by the experiments of the late Col. Morin, and confirmed by those of Mess. Briggs and Towne, when the arc of contact is 180°; or, in other words, when the belt touched "half-round" the pulley; but I have found no record of actual tests where the belt only touched one-quarter round, or 90°, or where it was carried three-quarters round or 270°, though I have found plenty of theoretical calculations of what the result ought to be. In order to satisfy myself on this point these experiments were made, but have not yet been carried out as fully as might be wished. They give the additional weight, which a belt equally loaded at each end would support on one end without slipping. This result was attained by the use of a model shown in the accompanying engraving, and loading the belt at one end till it slipped, and then reducing the load by half a pound at a time until it became stationary.

The belts used were three inches wide, one entirely new, one old but in good order and quite soft with oil, and finally the same belt after drying three weeks.

The total weight of belt and weight pans at each end was 14½ lbs., or 7¼ lbs. for each end.

To obtain the different angles, the belt was led over an anti-friction roller of wood, 3″ in diameter, 6″ long, and hung on a steel spindle, ¼″ in diameter, which would move with the difference in weight of the ends of the belt only, if the latter was not carefully balanced over it. This roller was supported in an adjustible stand which allowed it to be placed so as to cause the belt to subtend different segments of the pulley as shown in sketch.

The 36″ pulley had been used in a cotton mill and was highly polished; the 26″ was finished ready for use, and the 18″ was also called "finished," but not so perfectly as the 26″ one.

The results show that with a friction contact of 90° the additional weight supported without slip was about ¼ of the original load. With 180° contact, the weight supported in addition was about ½ the original, and with 270° rather more than the same, or in other words, at 90° = ⅛ the pull on the strained end, at 180° = ½ the pull, and at 270° = ¾ the pull.

Other business has prevented me from preparing a paper which would show more fully the practical deductions which may be drawn from these experiments, but I hope that it may be in my power to do so before the next meeting of the Society of Mechanical Engineers.

Meanwhile, these experiments may be of value to others, as they stand, should their completion be farther interfered with.

LETTERS FROM PRACTICAL MEN.

Management of Boilers and Engines.

Editor American Machinist:

Some two years ago I first saw the AMERICAN MACHINIST. A friend of mine had a copy in his pocket, he lent it to me, and I perused its columns with much interest; have subscribed for it ever since of my news dealer; think it is the most practical paper of its kind in existence. *The answers in its Correspondents' columns are worth far more than the price of the paper.* I have read with benefit the letters from practical men, and can understand the whole. It is just the thing for practical men who wish to become better informed in practical knowledge. After reading thoroughly, I have given many copies to my friends; they all speak the same in regard to it.

Seeing that you encourage letters from practical men, and not seeing any from this part of the State, I thought I would attempt one myself, and it remains with you, Mr. Editor, whether it is worthy of printing or not.

Do not many writers do the steam-boiler owner much injustice? Are they not a little too hard on him in their criticisms in regard to the management of steam machinery under his ownership?

He does not know everything, to be sure—but very little, perhaps, about the management of machinery. In fact, he leaves this to his engineer, and, I think, if the engineer would report the condition of things, and point out the necessary improvements that should be made, and the possible and probable consequences if not repaired, the owner would doubtless have the repairs made. Perhaps his engineer has been highly recommended to him as a competent and trustworthy man.

No doubt that Mr. B., who recommended this man as an engineer, knows no more about the duties and requirements of an engineer than the owner to which he has recommended him; but this man has run Mr. B.'s engine for six months or a year, and he never exploded Mr. B.'s boiler, nor did Mr. B. ever have to stop his work on the engineer's account. He could be depended upon. He was always at his post, but alas, he is no engineer. He has allowed the boiler to become corroded. He has run the cylinder for days without the proper amount of oil, etc., etc. Mr. B. knows nothing of all this, but he does know that his coal and water bills are larger than before this man took charge of his machinery, but he has not the remotest idea of the reason why it is so. This man is about to leave Mr. B.'s employ, and Mr. B. has given him a recommendation to Mr. W. Mr. B. is very sorry to have him go. He was a good man in B.'s estimation.

He looks around for another man in hopes to get a good one; he finds one that he thinks will suit him, Mr. C., and takes him on trial. C. takes charge, finds that he is burning more fuel than he should, and also finds that he is running higher steam than he thinks should be necessary. He begins to put his common sense to work as to the cause, and thinks he has found it—perhaps he has. Let us see:

The first opportunity he gets he removes the steam chest and cylinder covers, and finds the valve badly cut, and that the cylinder needs boring. The main bearing needs babbitting. He reports this to Mr. B. and requests him to shut down for a day or two. Mr. B. reluctantly consents to do so, as he is very busy. But shut down he does, and while the machinists are making the necessary repairs on the engine, Mr. C. empties his boiler, and finds it badly corroded externally and the flues leaking. He gives the boiler a thorough cleansing—and its connections, too—grinds in stop and safety valve takes a broken pulley off the safety valve, lever, overhauls gauge cocks, and by the time he has done all this, the engine is ready for action. He fills his boiler and starts up, and need it be said that the proprietor is astonished at the economic result? The latter comes to the conclusion that there is the right stuff in Mr. C., and that there is something more than pumping water and shoveling coal in running steam machinery, so he raises C.'s pay, and is saving money by having him run the engine. If C. asks for anything pertaining to engine or boiler, he gets it. In fact, the proprietor has become educated as regards these things, and would not have the old engineer back, if he would work for nothing. He has had enough of cheap engineers.

Proprietors are becoming educated the same way every day, but not half fast enough. Most employers do not take into consideration that one engineer can consume from 25 to 50 per cent. more fuel than another; also, that expenses on repairs and other matters will be in the same proportion. The man has run an engine, and that is all that is required of him in the employer's opinion. As long as employers are of this opinion, who can wonder at boiler explosions? I simply wonder that there are no more, when we look about us and see how boilers are managed; blown out when the masonry is overheated; safety-valves overloaded, and corroded to their seats; gauge cocks stopped up; pressure gauges out of order; boilers corroded; flues choked; and other bad disorders. When we come to see all this, we wonder there are not more crystallized, distorted, lagged, and twisted boilers, and why there are no more disastrous explosions.

I once knew an old flue boiler, that was so thin that the back end fell down, forcing the support through the shell. This boiler had been in constant use for many years; but business became dull, and it was allowed to stand for a short time nearly full of water; and when the engineer came into the boiler room, the day previous to starting, he found the boiler in this condition, evidently too weak at that point to sustain its own weight. I was once called upon to run an engine in a large leather manufactory. I found that the gauge cocks had not been in use for a long time, and could not start them from their seats. On making enquiry, I found that the engineer had for two years depended solely upon an automatic water gauge. Now we all know that any automatic arrangement for indicating the water level in a steam boiler is not a reliable device, nor is it possible to construct one that is reliable. When boiler owners become convinced that patent damper regulators, automatic boiler feeds, low water alarms, fusible plugs, etc., do not, with an ignorant engineer, make a boiler safe and prevent explosions, the better it will be for the community, although I do not condemn their use, but rather encourage their adoption, if properly cared for by a competent man; but it would be far better to pay their equivalent to a good man, rather than use them with a common laborer as engineer. I, for one, would not trust myself to labor in a building where they use an automatic boiler feed for pumping the water, and a common laborer to shovel the coal, nor do I think you would, Mr. Editor. No wonder boilers get mad and "bust" themselves.

In writing this composition, I do not wish to condemn our engineers, as a class, but only a portion of them, for who can dispute that some engineers that have charge of our best engines and boilers are totally ignorant of the principles of their construction and management; men that could not find the area of their safety valve or piston, and if what I have written causes any employer to be more discreet in employing a man to take charge as engineer, or should be the means of any tyro in the business (or even those of more experience) to try to become more educated and familiar in regard to management and complexure of steam machinery, it will have accomplished the object for which I wrote it.

Beverly, Mass. SMOKE ARCH.

The Hall Manufacturing Company, 23 Dey street, New York, announce that by authority of the Supreme Court, in an order issued March 16th, 1881, they have changed their corporate name to the "Prentiss Vise Company." Gen. John E. Mulford remains President.

A Hydraulic Governor.

We illustrate herewith a new hydraulic governor which seems to be attracting considerable attention among engineers.

The action of this governor differs very materially from those in ordinary use, inasmuch as the actuating power is derived from a force pump pumping a fluid under a weighted piston and through an adjustable opening.

The weighted piston rising and falling by the action of the pump, regulates the supply of steam to the cylinder.

One of the accompanying engravings represents the governor complete, and the other, a sectional view of the same. By the aid of these the reader will readily understand the following description :

The pump *A* consists of two revolving pistons similar to those used in the original Roots blower connected by gears. This pump is enclosed within a close-fitting case as shown, and surrounded with oil which fills the reservoir *D*.

The pulley being set in motion, the oil, following the direction of the arrow, is drawn up, and filling a chamber above, exerts a pressure upon the piston *B*.

The surplus oil passes out through the valve *C*, returning to the reservoir again; thus a continuous circulation is kept up so long as the pump is in motion.

As the speed is increased, more oil is pumped up than can easily escape through the valve *C*, consequently the pressure upon the piston *B* is sufficient to raise it and hold it in equilibrium.

It will be understood that the piston *B*, in rising, moves with it the balance weights shown attached to the valve stem by means of levers, and closes the valve, cutting off the supply of steam.

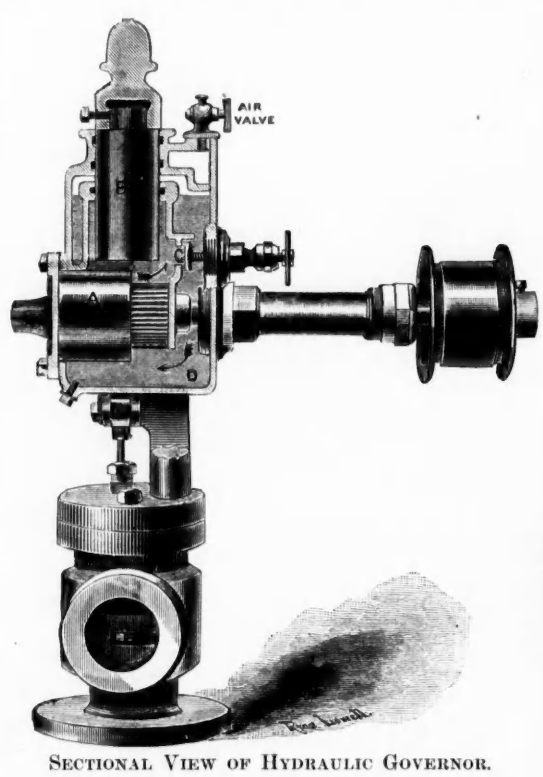
As the speed of the engine diminishes the pressure of oil under the piston falls, thus opening the valve and admitting more steam to the cylinder.

The revolutions of the engine are by this mechanism kept nearly uniform, it being understood that no governor will operate until there is a variation in the speed of the engine, and that the best governor is the one which will recover from the shock and regulate the speed of an engine quickest.

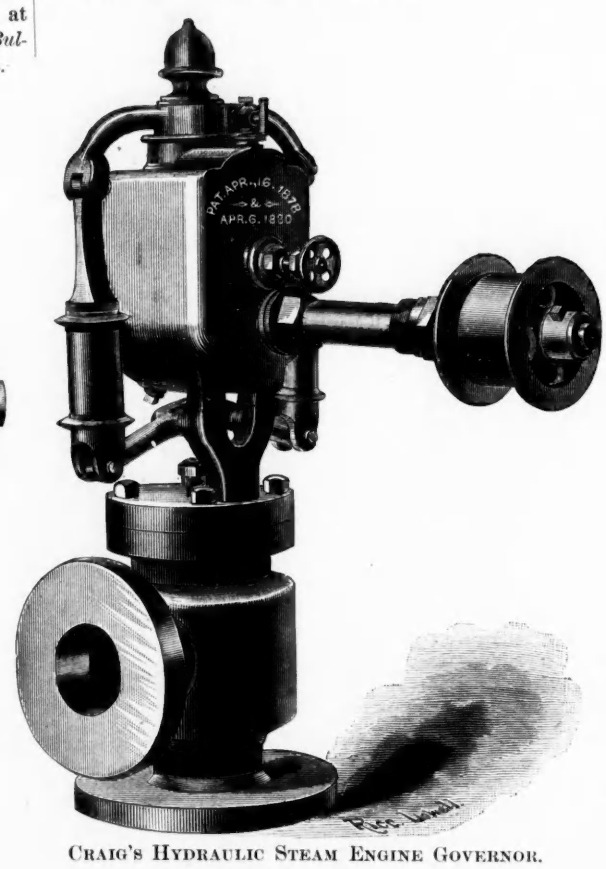
By opening the valve *C* wider the engine will necessarily run faster, and by closing it the engine will run slower.

An air valve is placed at the top of the reservoir for the purpose of filling it with oil, also to introduce an air cushion in case of violent oscillations or jumping of the governor. The principle of holding dead weight in equilibrium is sensible to the slightest change in the speed of the engine, yet admitting the requisite amount of steam to do the work. There are no springs used in the construction of this governor, and the rotating parts being immersed in oil, there is but little friction. There are no springs to compress to change the speed, consequently full-pressure steam is admitted at one speed as well as another. This governor is simple in construction and durable, and is made with flanges or screw threaded for application to all classes of engines.

A positive automatic stop-motion is attached when desired, which will shut off the steam at once in case the belt breaks or slips off the pulley. The Craig hydraulic governor is made by W. H. Craig & Co., Lawrence, Mass. All its parts are made by a system of duplication.



Sectional View of Hydraulic Governor.



Craig's Hydraulic Steam Engine Governor.

The Pennsylvania Railroad Company has issued orders for the construction of eight more "Class K" engines at the Altoona shops, counterparts of the mammouth No. 10, recently put on the New York division, and which has accomplished the distance, ninety miles, in about ninety minutes, at the head of a loaded passenger train.—*Bulletin of the Am. Iron and Steel Association.*

Twist Drill and Tool-Grinding Machine.

The machine herewith illustrated is intend to grind tools, at any given angle, from zero to ninety degrees, giving any desired clearance. It uses a wheel which has an annular recess in each of its sides, allowing the edge of the tool to pass across the entire width of the grinding face of the wheel, thus making the edge straight. It is claimed to be especially adapted to grinding threading tools, either V, half V, or square thread, or any tools whose edges are made up of straight lines, giving accurate angles and centers to tools and drills, as, by grinding on the side of the recessed wheel, a straight flat cut can be obtained.

Fig. 1 shows a drill-grinding attachment, by means of which it is claimed twist drills or flat drills may be ground with perfect accuracy. The shank of the drill is held in a socket the same as when in use. The point is held in jaws adjusted with a right and left-hand screw. By means of the graduated and pivoted tool-block the point of the drill may be placed at any angle or clearance with the grinding face of the wheel and ground the same as a tool, using only one side of the wheel. After grinding one lip, it is turned exactly half round by means of an index on the end of the spindle holding the drill, and the other lip is ground. Then by passing the point just inside the grinding face, and drawing out the index pin, and turning the spindle forward, clearance is given to the back corner without making the edge too thin, and the drill is put in the best possible condition for use. Twist or flat drills of any length or size up to two inches, can be ground on this machine.

Fig. 2 represents the machine in use for grinding tools. The tool is fastened to the top of a circular graduated and pivoted tool-block, and held the same as when in use in the lathe or planer, being adjusted by the index on the edge of the block to any desired angle and clearance with the grinding face of the wheel, and when brought in contact with, and passed across the wheel by means of feed-screws the edge is made perfect. Then (without unfastening the tool) passing it to the other side of the wheel by means of the feed screws, the operation is repeated. The machine has a steel spindle with adjustable taper bearings, of gun metal. A wheel for general use can be mounted on the other end of the spindle as shown. It is furnished with patent corundum wheels which are made specially for tool grinding.

This machine is made by John P. Fay, 127 Beacon Street, Worcester, Mass.

Fig. 1.

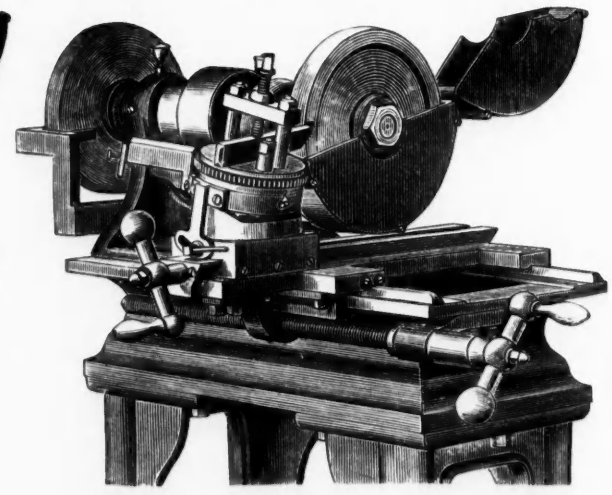


Fig. 2.

A Dresden man has made a good lubricant for shafts by mixing the whites of eggs with the finest graphite powder, until of the consistency of firm dough. This is kept in boiling water till the whole is coagulated. The mass is then reduced to powder.

Mechanical Terms.

By W. Barnet Le Van.

The technical terms which are in use do not seem to be generally comprehended by the majority of our mechanics and engineers, from the fact that a large number of terms are in use which mean one and the same thing.

The distinction particularly between the terms *force, power* and *work* is not clearly understood.

DYNAMICS.

Is the science of that branch of mechanics which treats of *force in* motion, *power* and *work*. It comprehends the action of all kinds of machinery, manual and animal labor, in the transformation of physical work.

ELEMENT.

Element is an essential principle which cannot be resolved into two or more different principles. The simple physical elements of dynamics are *force, velocity* and *time*, and the functions of those elements are *power, space* and *work*.

FUNCTION.

Function is any compound result or product of two or more different elements.

A function is resolved by dividing it with one or more of its elements.

FORCE.

Force is any action which can be expressed simply by weight, and which can be realized only by an equal amount of reaction, and is the first element in dynamics.

All bodies in nature possess the incessant virtues of attracting and repelling one another, which action is recognized as force.

VELOCITY.

Velocity is speed or rate of motion, and is the second element in dynamics.

TIME.

Time implies a continuous perception, recognized as duration, or that measured by a clock, and is the third element in dynamics.

POWER.

Power is the product of force and velocity ; that is to say, a force multiplied by the velocity with which it is acting, is the power in operation. Power is the differential of work or any action which produces work, whether mental or physical. Power multiplied by the time of action is work—work divided by time is power.

WORK.

Work is the product obtained by multiplying together the three simple elements *force, velocity* and *time.*

The Gamgee ammonia engine has been pronounced impracticable by competent scientific authority. Prof. Newcomb says "There is absolutely no new principle claimed in connection with the machinery, and claims made for it are in direct contradiction to the second law of thermo-dynamics.

"As there is nothing new in any of the principles called into play in the proposed engine, it may be pronounced a chimera with as much safety and certainty as we call perpetual motion machines by that name."

LETTERS FROM PRACTICAL MEN.

A Steam-Heating Device for Shops.

Editor American Machinist:

I send you a sketch of a very simple and inexpensive device for heating a machine shop, from the exhaust steam of the engine. In Fig. 1, *A* is an old tubular boiler which is mounted as shown, with one end through the wall, and about ten or twelve feet from the floor, so as to be out of the way. If convenient it should be mounted as nearly over the engine as possible. *B*, is an ordinary blower, fitted with a hood *C*, which makes an air-tight communication from the boiler *A*. *D*, is a hood to prevent the blower from taking any air except through the hood *C*. *E*, is the pulley of blower; *F*, the exhaust pipe of the engine opening into the top of *A*; *G*, the outlet for exhaust steam entering through *F*, and *H*—wall of shop.

The fan should be arranged to be run at different speeds, so as to deliver more or less hot air, as the weather demands. The blower or fan delivers the air into a large central pipe, running lengthwise of the shop. From this central pipe, branch pipes run to the wall, and down to within two feet of the floor. Fig. 2 represents the end of one of these branch pipes, *y* being the pipe and *z* a sheet-iron strip, by which the pipe *y* may be closed, by sliding the strip *z* in or out. When the engine is started, the exhaust finds its way through *F* into *A*, around the flues and out at *G*. The fan draws the outside air through the flues *i*, *i*, which abstracts the heat from the exhaust steam, and is finally forced into the central pipe, and delivered through the branch pipes in any quantity necessary.

The advantages of this plan are its cheapness and efficiency. Any old tubular boiler will do, which would be improved for the purpose if entirely filled with tubes. The inside air is as pure as the outside. On cold days the fan may be run faster, and be made to force more heated air into the shop. The water which escapes from *G*, being perfectly pure, may be advantageously used to supply the boiler again, as it is free from scale, and is also heated.

A 36″ shell, 15 feet long and filled with 2″ tubes, rigged up as shown, has been used for heating a shop 60 ft. by 120 ft.; the engine being a 12″ x 24″. All of the heat in the exhaust steam was not necessary, as the shop was easily heated to 70° and over during the coldest days, without running the fan so fast as to condense all of the steam. The pipe into which the fan delivered, and which extended the entire length of the shop, was of ordinary stove-pipe iron, 18″ in diameter. This pipe was on a level with the heater *A*,—up about ten feet from the floor, so as to be out of the way. The branch pipes running from the central pipe to the wall and down to within 2″ of the floor were 6″ in diameter, and were 12 in number, six on each side of the shop. Those nearest to the fan would, unless the valve *z* is partly closed, Fig. 2, deliver more than their portion of hot air to the detriment of those more remotely situated; but by regulating the opening by trial, and in proportion to the distance of pipes from the fan, the shop's temperature will be equal in every part. The plan is much superior to heating by steam pipes, and is in fact the best and cheapest heating rig in existence.

SUTHERLAND.

Objections to Tight and Loose Pulleys on Main Shafts.

Editor American Machinist:

I notice that E. E. Joseph objects to E. C. Lander's suggestion on tight and loose pulleys on main shafts. As the article was from my pen, I will state that the articles which I write are prepared from a practical and daily experience in the various workshops that I have worked in. I never have found any difficulty in shifting the belt instantly. In mechanical engineering, the use of a binder is considered poor practice, especially on large belts. The most common and practical way of running belts is in a horizontal position; now and then in a vertical position, from floor to floor. By his method it requires a large hole in each floor for the belt, which is objectionable. By the method which I proposed, only a small hole is needed to use a binder. It should be midway between the centers of the shafts. A binder pulley of large diameter is needed, which takes up room, and is also objectionable. The use of a small one only shortens the life of the binder from excessive revolutions, which causes a continuous and rattling noise—no objection to that, of course. The employment of a friction break—another addition requiring one person, perhaps, to each is objectionable. A few years' work on such a device, in which the binder was used for the purpose of keeping the slack out of the belts used on steam elevators, convinced the parties owning it, as well as the builders that the device was impracticable, of no value whatever, and has long since been abandoned as a failure, and not from want of experiment with a view to its adoption on the machines they built. I believe that there is no trouble in using a shipper for the purpose of stopping a machine. Does he find it so on a lathe that is offering resistance? I find that the machine stops almost instantaneously. Has he ever seen a belt elevator? I have, and found that the instant the hand rope was shifted—making an allowance for a small space of time which all things in nature require before coming to a full stop—that the principle of using a shipper is the oldest and best method for the object here mentioned.

C. E. SIMONDS.

London St., East Boston, Mass.

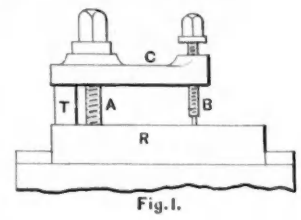
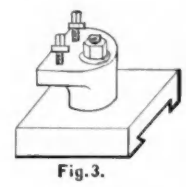


Fig. 1.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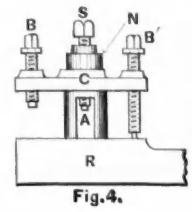

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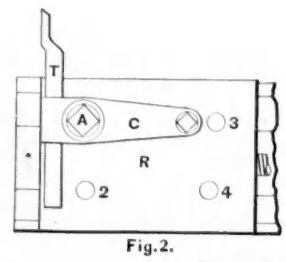


Fig. 2.

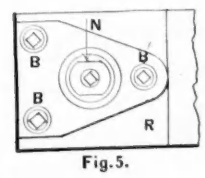


Fig. 5.

TOOL POSTS.

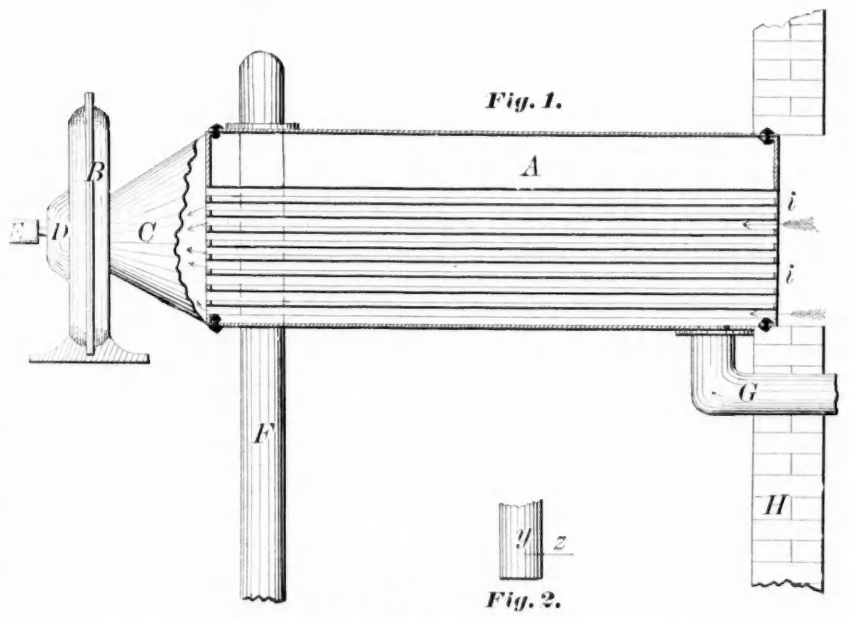


Fig. 1.

Fig. 2.

STEAM HEATING DEVICE FOR SHOPS.

A Crusty and Slovenly Foreman.

Editor American Machinist:

Having had occasion to call upon the chief engineer of a large manufacturing establishment the other day, I was obliged to wait in his office—which looked out upon a floor of the machine shop—for a little time, until he made his appearance. I naturally enough looked through the door to see if I could find anything new going on. While watching the different movements of the men, I noticed one particularly dirty-looking individual giving orders to another, who apparently did not get the full drift of the order given. The dirty individual became somewhat out of patience, and answered him in a short, curt way, that surely did not help the man's understanding much, as he evidently turned away with an unsatisfied look, mingled with contempt, for the man giving the order.

I may have imagined this as I could but imagine the disgust which I presume he felt.

The dirty man hurried to another individual with the remark that "he bet Bill would spoil that job before he got through with it; he never did do a job right yet." As I sat wondering in my own mind what encouragement the man had to do a good job, if his orders were never given him in a more clear and concise, to say nothing of a pleasanter manner, than those I had heard given him a few moments before, the chief came in, and being very well acquainted with him, I asked who the dirty man was. He replied: "John, the foreman of this floor." I suggested that a foreman should look cleaner than he, if he would have others respect him. "Yes, I know," was his reply, "but John gets into the very thickest of the work always, and as our work is mostly repairs, it is dirty work." I replied that I couldn't see the necessity of his being so much dirtier than the men working for him. "No," he said, "there isn't any use in it, but John is peculiar. He is a good man though, and has been with us a long time." Yes, I ventured, I thought he was peculiar, and I related the manner in which I had heard the order given. He colored slightly, and remarked that he "did wish John was different, as he had very many good qualities. His disposition is so peculiar. It is hard for men to understand him, and we sometimes lose the best class of mechanics we have through his short-sighted crustiness. He is not a favorite among the men at all, but he looks after the work well, and drives it along, and we put up with his peculiarities."

I transacted my business and went away, but the dirty foreman didn't. He was uppermost in my mind all day, and I have wondered since if his "good qualities" would balance the poor and sometimes spoiled work, which must be due to the inefficient manner in which his directions were given to the workmen.

THOUGHT.

More About Mechanical Drawing.

Editor American Machinist:

Not wishing to criticise so able a writer as Chordal, still I would offer a few suggestions. Referring to Fig. 1, of his article in April 23d issue, Chordal says it is the plainest and easiest made form of drawing, but that it fails to explain itself. With the addition of the written explanations which he places upon his drawing (Fig. 8), would not Fig. 1 be the better of the two? He further states that working drawings should be made by the golden rule, "Use only those lines which outline forms or define forms or dimensions;" which certainly is a good and safe rule to follow. With this in mind, I would ask why he uses the heavy shadow lines which are only ornamental, and would seem to be objectionable? If a line is $\frac{3}{100}$ of an inch in breadth, which side of the line is to be taken as representing the true dimensions of the object which it outlines? It may be said that the mechanic should work by the figures given, and that the dimensions are of no consequence. With the first part of this proposition I agree entirely; but in Chordal's drawing (Fig. 8) only a portion of the dimensions are given; the remainder, we must infer, are to be taken from measurement, or else this drawing "fails to explain itself."

In practice, it will be found necessary to use the scale upon drawings occasionally, whatever system is used; and, therefore, it is an advantage to have the lines as accurate and fine as is consistent with the qualities of clearness and durability. In the article referred to, it is said that the workman forms his ideas of the exactness required in a given piece of work, from the neatness and accuracy of the drawing from which it is to be made. Allowing this to be true, and I think it is in a measure, will not the fine, sharp lines impress him with the necessity of fine workmanship to a greater degree than will the coarse, heavy shadow lines?

These suggestions are made with due respect for the opinions of others, the object being to compare ideas, and adopt the best.

Hartford, Conn. R.

About Tool Posts.

Editor American Machinist:

The Whitworth tool post shown in Mr. Roberts' letter in your issue of April 16th is a good one for heavy lathes, or for heavy duty on small lathes, but not so good, I think, as the Maudslay clamp shown herewith, in Fig. 1, in which *C* is the tool clamp, held to the rest *R* by the screw *A*, which is tapped into the rest; *B* is a screw, threaded in the end of the clamp *C*, and abutting against the rest top; *A* is tightened to grip the tool surface fair, but not too tight; then *B* is screwed up, moving *C* as a lever, and gripping the tool more firmly than by any other means I know of. A plain view of the device is shown in Fig. 2. There are four holes to receive the screw *A*, and in England, where very heavy cuts are taken, two of the clamps *C*, are used.

Another form of swivel tool holder used on some lathes, and not very common, though quite handy, is that shown in Fig. 3, which is simply pivoted on the central screw. This has two screws for holding the tool.

In R. Hoe & Co.'s shop there are several combination tool-holding devices, such as is shown in Figs. 4 and 5. A common tool post *A*, is provided with a cap *C*, held by a circular nut *N*. This cap carries three screws *B B*, for holding the tool, and *B′* for actuating a lever after the manner of the the screw *B* in Fig. 1. In all these devices the tool can be gripped close to the edge of the rest, which is an advantage. There can be no question that J. J. Newbaker's toolholder, in your issue of Feb. 26, is an excellent one for finishing curves, sweeps, etc., especially when turned up, as described by Mr. Roberts, because the tool can be sharpened by grinding the front face, thus keeping the curve more uniform than it would likely remain if ground on the edge to sharpen.

I would suggest, however, that the cutters be recessed on the front face, so that there will be but little metal to grind.

JOSHUA ROSE, M. E.

New York.

Valve Motion.

Editor American Machinist:

There are many who think they could improve on the preacher, after having heard the text and the heads of the discourse. I do not propose to criticise Mr. Clemens' delineations of the motion of a slide valve and crank, as given in your issue of April 30, 1881. I have attempted a similar task frequently, and never succeeded so well but before I had gotten half through, would be lost in the labyrinth of lines and figures, and I fear many of your readers will never find their way through Mr. C.'s valuable work. I must therefore be pardoned for saying, I think he explains too much.

When full of this subject, and not being able to satisfy myself with drawings, I devised a very simple apparatus which demonstrated the various movements of the piston and valve in a much better way than can be done on paper, or even in practice on an engine.

The contrivance referred to was made as represented in Figs. 1 and 2, presented herewith which shows two elevations, front and back. The wooden body piece *B* may be of any convenient thickness that will give steady motion to the crank stud *A*. The dial plate *E*, may be of brass or any other suitable material, and graduated with any desired number of divisions. The line *D*, will show the relative position of cross-head *H*, and crank *F*. The pieces *d*, *d*, which form the valve and seat, may be made easily interchangeable with pieces showing the various proportions of valves and seats; the required stroke being obtained by the adjustment of the wrist pin in the slotted crank *F*. The pointer on dial should be set so as to indicate the dead centers when at 1, 1.

Further explanation is, I think, unnecessary. By this simple instrument all the varied and intricate functions of the slide valve may be readily demonstrated, and in many respects, in a much more intelligible manner than by any mathematical delineations.

By introducing a link at *H*, and eccentrics at *A*, all the varied peculiarities of this motion may be seen at a glance.

Such an instrument should not be made less than half size, and from this to full size; and could, I think, be profitably used in various departments where the steam engine is made a study.

Chattanooga, Tenn. QUIRK.

It Does Stop.

Editor American Machinist:

I noticed in your paper of April 30, page 5, an item headed, "Does It Stop?" under the general head of "Letters from Practical Men."

The "practical man" who signs himself "Quirk" seems to be in doubt as to whether the cross head or piston of an engine comes to a stop at either end of the stroke or not.

From what little I know of the laws of mechanics, in regard to moving bodies, I should say that no body could change its motion to one directly opposite, without first coming to a stop.

The most elastic ball must come to a stand-still before beginning its rebound. The time of its stoppage is, of course, extremely short, but it stops nevertheless, else it could not retrace its path. The motion of a piston is acceded to by all to be a reciprocating one, and a reciprocating body always has the inseparable concomitant of alternate and successive stops.

How is it? Am I a little rusty on mechanics, or did Mr Quirk write the article in a fit of absent-mindedness?

Boston, Mass. E. E. CLARK.

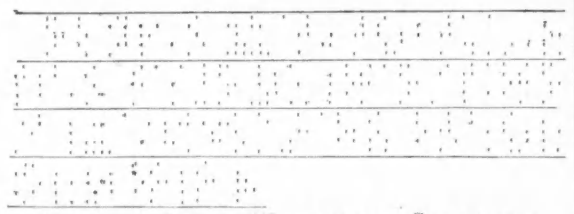
Using Patterns Instead of Drawings.

Editor American Machinist:

I was very much pleased with Chordal's ideas on the drawing question; I think he struck the nail right on the head, and sent it home. If any one can beat his common-sense drawing, let him speak out, and not hide his light under a bushel.

The machinist who could not understand his drawing at a glance, ought to be sent to oil up the North Pole.

It would be a good plan, where, on special machinery, a piece has to be often reproduced to make one, perfect in every respect, and use it as a pattern, instead of the detail drawing. It would be more likely to be duplicated than if left to re-measure from the drawing each part or form. How much easier it is to adjust the caliper to the real article wanted, than to its shadow.



THE LORD'S PRAYER, WRITTEN ON A STENOGRAPH.

The average machinist is not infallible. A measurement taken at one time is liable to differ slightly from one taken immediately afterwards, by the same workman, and a slight difference may sometimes make a bad job of it; but if we use a pattern, we can more readily get the correct sizes. This idea is not new, but may be useful to some of your many readers. The pattern should be marked, so as not to be used, except when no more are ever likely to be wanted.

It can then be used, and no loss of time or material will occur from its use.

Briggsville, Mass. B. WILSON.

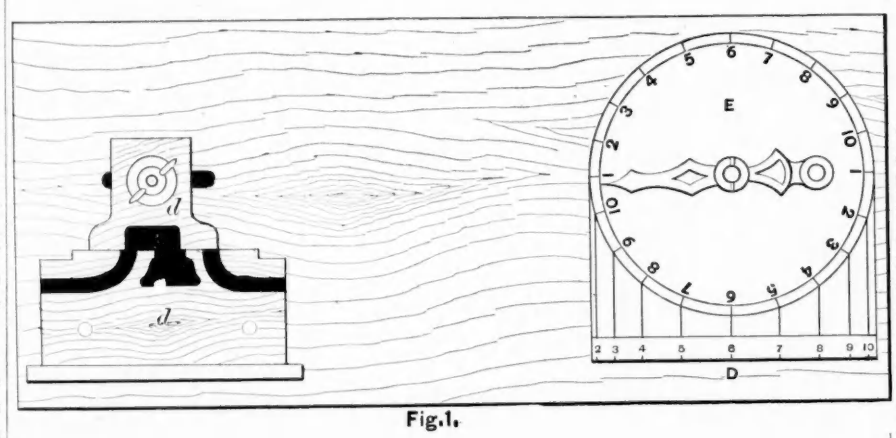


Fig. 1.

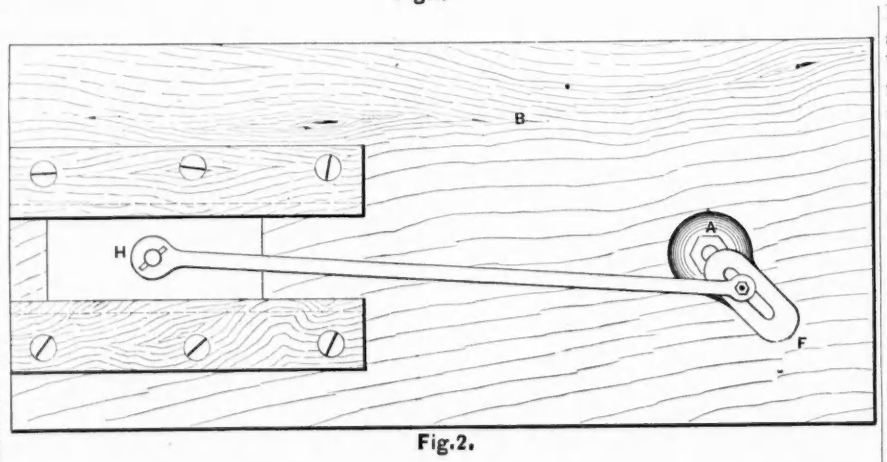


Fig. 2.

The Stenograph.

The instrument represented by the accompanying cut is the invention of M. M. Bartholomew, a practical reporter of Belleville, Illinois, who for a number of years has been actively engaged as professional stenographer in the courts of St. Clair and adjoining counties. In 1873 or '4, he conceived the idea that a machine might be made, by the use of which writing could be done as rapidly and more accurately than by the best systems of stenography then in use, and commenced making experiments, with a view of testing the correctness of that opinion. The result of his efforts in that direction is the stenograph, an instrument which has proven itself capable of recording over 600 letters per minute, which is more than sufficient to equal the speed of the most rapid stenographers.

The instrument is mounted upon a flat walnut board, 9 inches in length, by 8½ inches in width. Its height is 2½ inches, and its weight, case included, 3¼ lbs. It is simple and durable, and not liable to get out of order, and is easily operated.

The writing is brought about by the use of five markers, which singly and in combination form the alphabet. These markers are attached to the same number of keys, one of which is straight, and operated by either thumb. The remaining four keys are bent or curved around the point of the thumb key, and have buttons or finger-pieces at each extremity, upon which the fingers strike.

The characters are made upon a paper ribbon, which passes between the markers and the rubber roller, and is moved about $\frac{1}{18}$ of an inch by the same action that produces the letter.

The arrangement of the spacing key is such, that when it is depressed, the paper is made to move double the usual distance, and the spaces between the words are produced by striking it at the same time that the last letter of each word is made. Between the markers and the paper there is an inked ribbon, which is slowly wound from one reel to another, as the writing is done.

The phonetic plan is preferred, although words can be written in accordance with the common spelling. But one letter at a time is written, one being made with one hand, and the next with the other, and so on in alternation.

None of the difficulties which beset students in phonography are encountered in learning to operate the stenograph, as by it each letter is always made in the same way, and less than one-eighth as many word signs are used, and not exceeding one-thirtieth as many rules.

The following is claimed for it:

First.—That it is capable of being operated at a rate of speed, if not greater at least equal, to that of the most expert stenographers.

Second.—That it can be learned in less than half the time required to master any good system of stenography.

Third.—That it is more easily operated when learned.

Fourth.—That its legibility is almost equal to that of print, and the writing of one operator can easily be read by another.

Fifth.—That it can be operated without looking at it, thus enabling the operator to look at the person speaking, while writing what he says, and to keep his eyes on a book or paper, while copying or making extracts from it.

No extended effort has yet been made to put it on the market, the inventor having contented himself with perfecting it and teaching a few persons how to use it.

THE STENOGRAPH.

One of the instruments has been in daily use for some months past in the office of Fairbanks & Co., of St. Louis, where it is preferred to the old method, and others are in use in the same city.

A class is being taught to operate it in the Bryant and Stratton business college, of St. Louis, Mo., by the inventor, who has recently given up his position as court stenographer from the purpose of giving his entire time to the instrument.

Moulds of Green Sand, Dry Sand and Loam.

BY THOS. D. WEST.

Any section of the mould that is covered, in four or five seconds, with a body of iron about two inches thick can be rammed harder, and will require less venting, than if it took a longer time to get this body of iron over it. The thicker the body of iron, the more the air, steam and gases are forced to escape downward through the vents and sand. Wherever a scab is seen on a casting, it is certain that the iron bubbled and boiled at that point when pouring.

There must be a bubble before there can be a scab. The bubble may be caused by hardness, closeness or wet sand. The wet sand causes steam to be raised, and for release it will follow the direction of the least resistance. The same result will follow from hard ramming, or closeness of sand. The air and gases cannot escape fast enough through the vent and sand, so they lift or escape through the surface of the mould and through the iron, causing bubbling and scabbing of the mould.

There are instances in casting where the lower part of the mould is filled quickly, and as the rising iron comes up, it has to cover over a large surface projection, from which point upwards the casting is a solid body of iron; therefore the iron does not rise so fast in this section of the mould. The sand should be very open and well vented.

For such cases it is a good thing to mix some sharp sand, like lake or bank sand, in with the moulding sand, using this mixture as a facing sand. Projections in a mould generally need to be rammed and rodded well, and are the parts that need the greatest care. It is also important to keep all risers and feeding heads closed air tight, as, when they are open on this class of work, the air rushes out taking the pressure of the air and gases off the surface of the projection. As the lower part of the mould fills up first, the gases and vent from it will be drawn by the escaping current of air through the riser. This combined current, in escaping, lifts or starts the surface of the projections, and when the iron comes up to it, the iron fills up all the vent holes and sets the mould blowing. A blowing mould from this cause is a dangerous one. In some cases it will not stop until almost all the iron is blown out of the mould. The above are the main and a few of the many reasons for lost and scabby castings in green sand moulds.

As regards scabbing in loam and dry sand moulds, the first and greatest cause is in not having the mould well dried, as the steam generated in process of casting acts on this class of work in the same manner as it does on green sand work. The only difference is, that sometimes the loam or dry sand buckles, or is pushed out into the molten iron. This buckling is caused by confined steam, gases, air, or some kinds of close sand. The buckling in such cases is not like a green sand

scab. When the casting is taken from the sand, a few blows with a hammer upon the scabbed spot will cause the lumps of sand to fly out, leaving holes in the casting. In the case of a green sand scab, the sand is always found in some other part of the casting. In loam or dry sand, there is not the amount of air or gases to be carried off by vents that there is in green sand. It is only in pockets, corners and under flanges, that it becomes necessary to carry off vents directly. With a mould well dried, and the loam, sand and blacking mixed in the proper proportions, there is very little danger of scabs. Having had about an equal practice in the three branches, I can safely say, that green sand work, so far as scabbing is concerned, is the most difficult to contend with. Little does a looker-on know of the unseen injury to castings which a moulder can do by ramming the different parts of his mould too lightly or two heavily.

Foreign Technical Notes.

Translated for the AMERICAN MACHINIST.

MONSTER LOCOMOTIVE STEAM CRANE.

This monster locomotive crane, says *Jernskontoret*, was constructed by the well-known engineering firm, the Aktiebolaget "Vulkan," Malmoe, Sweden. It is designed to lift 12 tons, and is worked by two inclined cylinders, of 7 in. diameter, and 12 inches stroke. The crane pillar is of cast iron, 15 in. diameter at the bottom, fitted into a heavy cast iron cross fixed between the side frames of the carriage. These frames and the whole of the under carriage are of cast iron, and are made of unusual strength and weight, so as to give increased stability and ample adhesive power. The jib and tail pieces which carry the boiler, tank and crane gear, are constructed of massive wrought iron. The lifting, lowering, swinging and traveling motions, as well as that for raising and lowering the jib, are brought into and out of gear by friction clutches. The traveling motion is effected by gearing working from the driving shaft to beveled gearing connected to a steel shaft, 3 in. in diameter, working down the center of the crane pillar. The foot of this shaft is again connected by beveled gearing to an ordinary axle, whence the traveling motion is transmitted to the wheels by means of coupling rods secured to crank pins in the usual way. The crank pins have an entire throw of 20 in.; the power of the gearing is 8 to 1; the wheels are of cast iron with steel tires, 3 ft. in diameter; the axles are of the best forged scrap iron, of 5 in. diameter; all the bearings are of the best gun metal. The crane swings round the pillar at the top upon a steel bush, and at the bottom upon three friction rollers, running in cross stays between the tail pieces. One of these is placed at the front under the jib, the other two at the back of the pillar. The boiler is 8 ft. 6 in. high, 3 ft. 9 in. diameter, and is composed of $\frac{3}{8}$ in. plates. The fire-box is 5 ft. by 3 ft. 3 in. diameter, and is fitted with five cross tubes 5 in. diameter outside. The feed-water is carried in a tank surrounding the boiler, and contains 300 gallons. This quantity is found to be sufficient to supply the boiler for 10 hours continuous working. The working pressure in the boiler is 60 pounds. The tractive force as a locomotive in actual practice is such that a load of 100 tons can readily be moved on a level, and 10 to 12 tons can be lifted with safety when the crane is standing with the jib in a line over the longitudinal center line of the carriage, whilst the addition of an extra balance-weight enables this weight to be swung completely round, or lifted sideways, without special stoutting. The total weight in working order is 30 tons. This crane is specially designed for use in ironworks, shipyards, foundries, quarries, and all other places where an expeditious loading and unloading is necessary.

EASY TEST FOR THE PURITY OF OLIVE OIL.

La Houille says that when it is desired only to ascertain whether the oil is pure or not, without precise reference to the nature of the oil used in adulteration, take equal quantities of olive oil known to be pure and the oil to be tested; place the samples in separate test tubes, into which a good thermometer may also be inserted, and heat each separately to a temperature of 482° Fahrenheit. The pure oil will become somewhat paler during the heating, while the adulterated oil will turn darker. The pure oil will emit a pleasant smell, while the adulterated oils will give off an offensive odor.

COATING COPPER WITH IRON..

Der Masch. Constr. says, that Prof. Boettger recommends the following solution for coating copper plates with iron. Ten parts of ferro-cyanide of potassium and twenty parts of tartrate of soda are dissolved in 220 parts of distilled water, adding a solution of three parts of sulphate of iron in fifty parts of water. Caustic soda solution is then poured into the mixture until the Prussian blue formed is re-dissolved.

BRAZING SAW BLADES.

The *Archiv f. Gew. u. Bauw.* remarks that saw blades can be brazed perfectly in the following manner: File the ends so that they will lap one over the other; paint the ends well with borax ground up with water on a ground glass or slate; bind the ends together firmly with iron wire; coat some small pieces of silver solder with borax, and place them on and near the joint; put behind the joint a piece of pumice-stone, and with a blow-pipe flame heat the joint until the solder melts.

NEW HYGROMETER.

According to the *Annalen der Physic u. Chemie*, a new form of hygrometer has been introduced by M. Edelmann, intended to be an improvement on Regnault's simple apparatus, already so long in use. In this new hygrometer, the air, whose hygrometric condition it is desired to ascertain, is introduced by aspiration into a large glass tube furnished with stop cocks, into which sulphuric acid is then let fall, which absorbs the aqueous vapor present in the air. A manometer attached to the tube indicates the diminution of pressure thus occasioned, which is exactly equal to the expansive force of the aqueous vapor in the air. A convenient arrangement of the apparatus permits the introduction of the acid without appreciable alteration of the volume of air in the tube, and a thermometer attached indicates whether any change of temperature occurs during the experiment.

NEW ELECTRIC SPEED INDICATOR.

The *Annales télégraphiques* report the invention of this new instrument. It appears that the speed indicators hitherto in vogue have usually been mechanical devices, fitted to be read at the place where the engine itself is situated; but M. Merlé, of the French Telegraph Department, has devised an electrical indicator which shows the correct speed of an engine placed at a distance. In the transmitting part of this apparatus each revolution made by the engine moves forward a ratchet-wheel one tooth at a time, and by this means sends an electric current to the distant receiver. The currents thus sent during each minute are "accumulated" in the receiver, till at the end of each minute, the indicating hand is unlocked by means of an accurate clock, and marks the number of currents received, or, in other words, the number of revolutions of the engine during the past minute. It follows, that the sum of the successive minute indications gives the total number of revolutions in a given time.

THE ANNEALING PROCESS OF STEEL.

In *Wiedemann's Annalen* it is stated, that it has been proved by Herren Strausthal & Barus, from experiments in which steel wire was treated so as to show all degrees of hardness between the glass hard and annealed states, that the thermo-electric and galvanic properties of steel vary with the degree of hardness in a very sensitive manner. Their researches throw some useful light on the nature of the annealing process and on the magnetic behavior of steel, in relation to its hardness and other properties.

Newly Incorporated Companies.

MASSACHUSETTS.

Aldrich Cook Manufacturing Co., Leominster; Aldrich Cook, President, Julian White, Treasurer. Capital, $5,000. For the manufacture of fancy articles in horn and other materials.

Boston Electric Protective Association, Boston; John A. Ordway, President, Benj. F. Dyer, Treasurer. Capital, $6,000. For the manufacture, application, use, sale and renting of electric and signal machines, and organizing, maintaining and using systems for the protection of property by electric and patrol services.

The East Haven Co., Boston; J. Alexander, W. Gaston, J. Quincey, F. O. Prince, J. W. Converse, E. F. Waters, E. A. White, N. C. Munson and others, incorporators. Capital, $250,000 with power to increase to $3,000,000. For the purpose of constructing and maintaining on their land, in East Boston, ship channels, basins, docks, wharves, elevators, warehouses, etc., suitable for terminal facilities for receiving, storing, delivering and forwarding all kinds of freight to and from vessels and railroads, with power to lay and maintain tracks to connect with railroads for the purpose above mentioned.

South Boston Ice Co., Boston; B. W. Woodward, President, L. H. Jones, Treasurer. Capital, $80,000. For the cutting, storing and selling of ice and other business incidental thereto.

Charles River Towing Co., Boston; Albert D. Henderson, President. L. G. Burnham, Treasurer. Capital, $1,000 (nominal). To do the business of towing in Boston harbor and vicinity.

CONNECTICUT.

The Converseville Co., Stafford; Freeman Patten, Laura A. Patten and Robbins Patten, incorporators; Capital, $20,000. For the manufacture of woolens.

NEW YORK.

The LeRoy Journal-Bearing Company, New York; T. V. LeRoy, Geo. W. McLean, J. B. Bostwick, Frank B. Birdsall and Louis C. Waehner, incorporators; Capital, 300,000. To manufacture, buy and sell journal bearings.

Buell, Merriman and Maxwell Company, limited, Rome, N. Y.; Henry C. Buell, Elizabeth M. Merriman, M. Louise Merriman, Henry C. Maxwell and Jennie M. Buell, incorporators; Capital, $75,000. To manufacture and sell malleable iron castings and saddlery hardware.

Automatic Lubricator Company, New York; Daniel R. Kelley, Lareu E. Ellsworth and Samuel Waggoner, incorporators; Capital, $100,000. To manufacture and sell automatic lubricators for railroad cars and machinery.

The Wellsville, Bolivar and Eldred Railroad Company; Wm. F. Jones, Wm. Duke, Aaron R. Hill, L. S. Anderson, Judson H. Clark, Henry N. Lewis, James Mackin, Edward J. Farnham, Wm. Beever. Henry Johnson, Alfred S. Brown, Isaac W. Fassett and Wm. A. Baldwin, directors; Capital, $100,000. To construct, maintain and operate a railroad, commencing in the village of Wellsville, Allegany County, and to extend to and terminate at the southern line of the State of New York at the village of Ceres, in said county. Length of road, about 21 miles.

The Gramme Electrical Company, New York; Wm. H. Appleton, Robert B. Minturn, Anson Phelps Stokes and Alexander Taylor, incorporators; Capital, $1,200,000. To manufacture and sell electric lights, and all the devices, appliances and power incidental thereto or necessary therefor.

Syracuse Screw Company, Syracuse; Chas. E. Hubbell, Joseph Fiessuger, Dwight F. Hayden and others, incorporators; Capital, $30,000. To manufacture and sell wood screws, and bolts of every kind and description.

The Angell Manufacturing Company, New York; Martin Dennis, Joseph McAlpin and W. McAlpin, incorporators; Capital, $60,000. To manufacture and sell machinery, jute and vegetable fiber products, and other merchandise.

The Olean Railroad Company; directors, C. V. B. Barse, Willis W. Barse, Henry S. Morris, Chas. S. Carey, Reuben O. Smith, Richard W. Evans, Dewitt C. Conklin, Lafayette F. Lawton, Geo. V. Forman, James Kelsey and Henry M. Ernst; Capital, $100,000. To construct, maintain and operate a railroad commencing in the village of Olean, and terminating at or near Allentown, in town of Alma, Allegany county. Length of road, about 24 miles.

Saratoga Electric Illuminating Company, Saratoga Springs; Wm. W. Worden, Casius B. Thomas and Wm. H. McCaffrey, incorporators. Capital, $50,000. To manufacture, own, sell and operate various apparatus and in producing light, heat and power by electricity, or used or to be used in electroplating.

The International Gas Company, New York; James W. Hodges, Samuel T. Anthony and Wm. M. Adler, incorporators. Capital, $1,000,000. For the manufacture and sale of gas, and the manufacture and erection of gas machines and gas works, and the operation and sale thereof.

NEW JERSEY.

The Union Construction Company, Jersey City; H. B. Hammond, Thomas F. Wentworth and Lucius L. Hubbard, incorporators. Capital stock, $1,000,000. To build, construct, enlarge or complete railroads, &c.

The Pine Point Mills, Camden; George A. Townley, James F. Wood and John B. Wood, incorporators. Capital stock, $13,000. To manufacture, bleach, dye and finish cotton, woolen, silk and other textile goods.

The Domestic Manufacturing Company, Newark; Eli J. Blake, John Dane, Jr. and Robert Blake, incorporators. Capital stock, $200,000. To manufacture and sell sewing machines and other articles of wood and metal.

PENNSYLVANIA.

The Spawn & Dennison Manufacturing Company, Reading; John N. Dennison, William M. Stauffer, John McKnight and others, incorporators. Capital, $25,000. For manufacturing and selling steam fire engines, hook and ladder trucks, hose carriages, fire apparatus, and firemen's supplies.

Iowa Barb Wire Company, Johnstown, Cambria county; Charles Douglass, George S. Douglass, William H. Richards and others, incorporators. Capital, $300,000. For manufacturing barbed wire and machinery for making the same, constructing and maintaining fences from barbed wire and hardware generally.

ILLINOIS.

The Lindley Manufacturing Company; Charles P. Lindley, Orlando J. Smith, E. Carlisle, and O. A. Smith, incorporators; Capital, $24,000. To manufacture and sell articles made from wood and metal. Location, Chicago.

Van De Poele Electric Light Company; Frank Douglas, Jno. O. Pierson, and Galusha Anderson, incorporators; Capital, $500,000. To manufacture and sell dynamo-electric machines, electric lamps, and a general variety of electrical materials and other machinery, and the operation of patents thereunder. Location, Chicago.

Chicago Anderson Pressed Brick Company; Jas. C. Anderson, Elisha Gray, Charles C. Bonney, and others, incorporators; Capital, $200,000. To manufacture and sell the pressed brick invented by Jas. C. Anderson, and to procure, establish, and use the machinery and process invented by said Anderson for the manufacture of brick. Location, Chicago.

The Trans-Continental Railroad of Illinois; Thos. S. Sprange, Amos D. Owen, John W. Spray, Richard S. Mallory, and Wm. B. Thompson, incorporators; Capital, $1,680,000. To construct and operate a railroad from some point upon the Wabash River, in Crawford County, westwardly, through the Counties of Crawford, Jasper, Effingham, Fayette, Bond, Madison and St. Clair to or near the city of East St. Louis. Principal office, Robinson, Crawford County, Ill.

Morris and Joliet Construction Co.; James G. Elwood, Elias L. Stevens, and Charles C. Moody, incorporators; Capital, $60,000. For the construction of railroads and other construction or contract work. Location, Joliet, Ills.

Fox Lake Steamboat Company; John O. Pierson, Benj. F. Weaver, and H. F. Boris, incorporators; Capital, $20,000. For the transportation of passengers and freight on Fox Lake and adjacent waters. Principal office, Chicago.

Process of Nickel Plating.

At a recent meeting of the Polytechnic Association of the American Institute, in reply to questions, Mr. Keith took up the subject of nickel plating. In 1868 a man named Remington took out a patent for nickel plating, which was about the time when attention was first drawn to this metal. In 1869 Dr. Adams took out his patent for the double sulphate of nickel and ammonia solution. For a long time it attracted little attention. The metal did not adhere perfectly, and the coating was looked upon with suspicion. This difficulty was overcome, and its good color and resistance to the tarnishing effect of the air, and especially sulphuretted hydrogen, has made it a great favorite. It is even superior to silver for many purposes, because of these properties. Care must be taken in the preparation of the metal upon which it is to be deposited. If it is iron, the emery wheel must be used to level the surface; this is followed by the buffing wheel, which polishes as highly as possible. To remove the grease with which the article is covered, it must go to the potash kettle. Usually this contains a solution of caustic soda. In this it is boiled until the grease is all dissolved. It is next washed to remove any of the soapy or greasy matter which may be remaining. The test of this is found in lifting the article from pure water, and noting whether there are any signs of the water crawling. The iron must now be "dipped"; this slightly roughens the surface and removes the adhering film of air. The solution is nearly a saturated one where Dr. Adams' double sulphate process is employed. Formerly, cast nickel plates were employed as anodes, then common grain nickel was placed between plates of some conducting substance, and thus an anode was formed. The solution is decomposed at the surface of the cathode, while the nickel is dissolved at the anode. Within a comparatively recent time, the Smee battery was the standard method of plating, but at the present day the dynamo-electric machine is almost exclusively used.

In answer to questions, Mr. Keith said that the cost of simple deposition of the metals was very cheap. Copper could be deposited for about one-quarter of a cent per pound. For example, in a shop in which he was acquainted, a six horse-power engine deposits nine pounds of copper per hour. This is, of course, independent of the cost of labor. Taking the cost of the power as twenty-five cents, and the acid with copper plates for anodes at twenty-five cents per pound, which is about the present price, the cost of the deposit would be about thirty cents per pound. If spread over small articles requiring much handling, the cost, of course, would be much more.

If a party needs a lathe, or any other general machine tool in a hurry, he will find just now unprecedented difficulty in getting one. When he hears of one for sale suited to his purpose, and waits a few days before applying for it, the chances are that he will find some one else has secured it.

AMERICAN MACHINIST

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NEW YORK, MAY 21, 1881.

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The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

Hartford Meeting of the Mechanical Engineers.

Elsewhere in our columns will be found an extended description of the proceedings of the American Society of Mechanical Engineers at their recent meeting in Hartford; Conn., together with two of the papers read on that occasion. Other papers and the discussions upon them, will appear in our columns in due season. The hospitable welcome given by the citizens of Hartford to the engineers is a compliment to that city, no less than to its guests. Recognized already as an important financial center, this meeting has well emphasized the character and standing of its industrial interests, as a centre for the manufacture of machine tools, drop forgings, engines, fire-arms, textile fabrics and general machinery.

The thirty engineers who met in the office of the American Machinist, Feb. 16, 1880, upon the invitation of Prof. John E. Sweet, Prof. R. H. Thurston and Mr. A. L. Holley, for the purpose of organizing this Society, met with an earnest purpose in view, and have reason to feel proud of the results of that day's work. A number of leading engineers, fully equal to the number of original organizers, was admitted to the Society, at the meeting last week. The fact that this list was headed by the veteran engineer, Capt. John Ericsson, now in his 78th year, only one of whose many titles to lasting fame is the invention of the iron-clad monitor system, speaks volumes for the impression which this young Society has already produced upon the mechanical public.

The desirability of a representative national association of mechanical engineers had long been recognized, but up to the time (about fifteen months ago) when Prof. Sweet developed a plan, and secured the ready co-operation of the two other gentlemen, above-mentioned, in carrying it out, for the thorough practical organization of such a society, no determined efforts had been put forth with that end in view, by any one competent to take the lead in such a movement. As soon, however, as the Society was started under such auspices, there was no doubt in the public mind about its solid and permanent success. It is not necessary to dwell upon the good likely to be accomplished by this Society, for that can readily be understood and appreciated by the mechanical public. Its growth in numbers and influence already is surprising only to those not acquainted with the demands which called it into existence.

Engineers' Licenses.

There are frequent inquiries, coming from engineers in certain localities, in relation to the laws requiring stationary engineers, as such, to be examined as to competency to fill their positions. For the information of such, we give some information about licenses. There is a State law in Connecticut, requiring stationary engineers to pass examination before they are allowed to take charge of boilers and engines. There is also a State law, requiring the same in New York; but the Legislature has refused to make any appropriation for the purpose of paying inspectors, and carrying out the law; consequently, the law is a dead letter.

We state, on reliable authority, that licenses for stationary engineers are required only in Brooklyn, New York City, and Yonkers, in this State. Each of those three cities have local license laws for engineers.

The State of Pennsylvania passed a law, requiring stationary engineers in the cities of Philadelphia and Pittsburgh to have licenses.

There are other cities in this country which have similar laws, among which may be mentioned Baltimore, Cincinnati, Chicago, and St. Louis. Wherever the law referred to exists, it is generally a local affair, and confined to certain close limits. Such laws are excellent for both engineers and employers, when properly respected and enforced.

They are good for engineers, because they require them to know something more of their business than merely to shovel coal into a furnace, and pump water into a boiler. They stimulate a disposition among engineers to think for themselves, and study out the theories and practical effects incidental to the use of steam.

Some engineers in this city look upon the law requiring an examination as an imposition, but it is not so in reality.

The fault lies in the loose manner in which the law is administered. Laws requiring all engineers, stationary, marine, and locomotive, to pass an examination, should be United States laws, and the engineers should not be required to pay *anything* for being examined. As United States license laws now exist, great injustice is done, for the reason that they require an engineer, who runs a small tug boat, to pay $10 per year for his licenses, when his wages are but little more than half that of an assistant upon a steamship, who pays the same for his license.

The locomotive engineer, in whose hands thousands of people daily risk their lives, wholly escapes from both the examination and the infliction of a tax upon his business, and runs no risk of losing a license, by allowing himself to neglect to apply for a renewal of the same only a day after it has expired.

Engineers should be examined by competent government officials, and no fee should be charged. Examinations should be properly conducted, and in no case should an engineer be refused a license, simply because he could not answer some nonsensical question pertaining to some doubtful theory, or some contingency which is never likely to arise. The questions should be of a thoroughly practical character, and the examiner should be a thoroughly practical man, so that justice may be done to the hundreds of practical men who are unable to explain themselves properly except in the plainest practical way. If this plan were adopted, employers would be supplied with a better class of engineers, and there would be fewer boiler explosions, caused by the carelessness of engineers who have never taken the trouble to inform themselves in regard to the requirements of their business. There is no excuse for any engineer of the present day being ignorant of the properties of steam and steam machinery; for he may find an abundance of both new and second-hand practical literature which will, by a little careful study, enlighten him in regard to the things he must do, and the things he must not do in managing a steam engine and boiler. Let us hope, then, that the time is not far distant when laws requiring all engineers to pass examination will be made United States laws, as, in their present condition, they are both inconsistent and unjust.

Chordal is on a sort of vacation which accounts for the non-appearance of "Extracts." He will soon be over the vacation, however, and ready for any mechanical predicament which may present itself for solution.

Commendable Strikes.

Of the many strikes by workingmen this Spring, not a few have been sustained by public sentiment, as for instance, the strike of the street-car drivers in Chicago, where the people refused to patronize the street-car lines until the demands of the drivers and conductors for increased pay were complied with. Another strike, which occurred in this city, did not lack public approval. The bakers, who had been required to work sixteen hours out of every twenty-four, seven days a week, and to board on their employers' premises, struck for a limitation to twelve hours' work per day and the liberty to choose their own boarding places. They demanded the privilege of living like free men, and the sympathies of all intelligent, right-minded citizens were with them. At first the proprietors of the bake shops conceded a reduction of time to fifteen hours a day, but their wonderful magnanimity was not appreciated. The bakers held out until their claims were recognized as men who need rest and recreation, not as beasts of burden, and twelve hours now constitute the time for a day's work, which is certainly enough. It may be that bakeries are required to run sixteen hours every day. If so, let them have two sets of workmen. Blast furnaces must run every hour in the week, but no furnace owner would think of asking men to work regularly two-thirds of the time. Men who are required, in any employment, to work two hours out of every three, from Monday morning till Saturday night, should be encouraged and assisted by the public at large to strike for a reduction of the hours of labor. When such cases are brought to public attention, the great mass of citizens need no urging to bestow their sympathy in the right direction. Strikes that meet public approval are not likely to fail, while those that meet public condemnation seldom accomplish their object.

It ought to be a source of great gratification to thoroughly skillful artisans in wood and metal work, in these busy times, to see proprietors of shops striking to secure the services of such artisans. A first-class mechanic who is competent to do good work without a foreman or overseer, can name any reasonable price for his services with the assurance that he can command it. The supply is not equal to the demand, and not likely to be for months, perhaps years, to come. These strikes convey a lesson to young men about to select an employment, which is plain enough to be comprehended.

The Secretary of the Master Car Builders' Association gives notice that the fifteenth annual meeting of that association will convene in the City of New York, June 14th. The Committee of Arrangements have selected the Park Avenue Hotel as the headquarters of the Association.

The Governor of New Jersey has signed the act prohibiting the employment of more than one hundred convicts, at any one branch of industry, at the New Jersey State Prison. The effect of the new law will be to put an end to the State prison convict labor, and after the first of July, the date when the present contracts end, all the convicts will be put in cells. The contractors say they cannot profitably employ only 100 men.

The next annual meeting of the Railway Master Mechanics Association at Providence, R. I., June 15th, promises to be largely attended, and very interesting, not only to railroad men, but to others engaged in mechanical pursuits. The society is a large and growing one.

Literary Notes.

James M. Swank, Special Agent of the U. S. Census Bureau for collecting statistics of the iron and steel industries, has made a preliminary report, which is published in a sixteen-page pamphlet. As a usual thing, statistics are dry reading, but these are worth study by any intelligent citizen, so we copy the following from that valuable pamphlet.

The following exhibit shows the number and capacity of the blast furnaces, rolling mills, steel works, forges, and bloomaries in the United States at the close of the census year, May 31, 1880:

Blast furnace establishments	490
Completed blast furnaces	681
Rolling mill establishments	324
Single puddling furnaces, each double furnace counting as two single furnaces	4,319
Rotary puddling furnace (Sellers)	1
Danks' puddling furnaces	19
Hammers in iron rolling mills	239
Heating furnaces	2,105
Trains of rolls in iron rolling mills	1,206
Nail machines	3,775
Steel works	73
Bessemer steel converters	24
Open hearth steel furnaces	37
Pot holes for crucible steel	2,691

Trains of rolls in steel works	136
Hammers in steel works	219
Forges and bloomaries	118
Forge and bloomary fires	495
Siemens' rotator	1
Hammers in forges and bloomaries	141
Daily capacity of blast furnaces, in net tons	19,248
Daily capacity of rolling mills, in net tons	16,430
Daily capacity of Bessemer steel converters, in net tons	4,467
Daily capacity of open-hearth steel furnaces, in net tons	827
Daily capacity of crucible steel works, in net tons	445
Daily capacity of forges and bloomaries, in net tons	520

The whole number of establishments in 1880 was 1,005. In 1870 it was 808. The percentage of increase in the ten years was 24.38. The size and capacity of the establishments were, however, much greater in 1880 than in 1870. As the capacity of blast furnaces only was given in 1870, no complete data are available for a comparison of the capacity of all the works in the two periods. The daily capacity of the blast furnaces in 1870 was 8,357 tons, and in 1880 it was 19,248 tons—an increase of 130.32 per cent. A comparison of the number of the various works in 1870 and 1880 is given below:

	1870.	1880.
Blast furnace establishments	386	490
Blast furnaces	574	681
Rolling mill establishments	310	324
Steel Works	30	73
Forges and bloomaries	82	118

The whole amount of capital invested in the iron and steel industries of the United States in 1880 was $230,971,884; in 1870 it was $121,772,074: increase, $109,199,810, or 89.68 per cent.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(1) D. W. M., Lynn, asks: Will you please instruct me how to find the heating surface of a horizontal boiler, and what is the heating surface of a boiler, also how to find the draft of a boiler? *A.*—Find the number of square feet of surface exposed to the fire on the under side of the boiler shell, and add to this ¾ of the tube surface in square feet, which will give you the whole amount of heating surface. The draft of the boiler or calorimeter or total sectional area of the flues or tubes should be 1-7 of the grate area, allowing 25 feet of heating surface to 1 square foot of grate.

(2) J. W. H., New York City asks: Will you please let me know the H.P. of our elevator engine having two cylinders, 6″x 8″ carrying 60 pounds of steam running 260 revolutions a minute? *A.*—About twenty-five Horse Power. An elevator engine cannot be made a very economical engine, from the fact that a considerable back pressure has to be introduced, in order to prevent the car from running down too fast.

(3) L. O. C., Sedalia, Mo., asks: Is the following rule correct to get the proper amount to cut out of a piston ring, so that it will go into the cylinder, namely: Three times the amount the ring is turned larger than the bore of the cylinder? *A.*—No. If you cut out 3 1-7 times the difference between the two diameters, (viz: the bore of the cylinder and outside diameter of the ring) the ring would go in when cold, but a little more should be cut out to allow for expansion of the ring when hot, as the ends should in no case touch each other. For a brass ring more allowance should be made than for cast iron on account of its greater expansion.

(4) J. W. P., West Bay City, Mich., asks: How small an engine and boiler can I use to propel a boat 16 ft. long with 3 ft. 6″ beam? *A.*—The engine should have a cylinder 3″ bore and 5″ stroke and run 300 revolutions per minute. The boiler should have 40 square feet of heating surface and 1½ square feet of grate. Use a two, or a three-bladed screw wheel 20″ in diameter with a pitch of about 30″.

(5) M. M., Albany, N. Y., writes: I am engaged in making oxygen gas for calcium or oxy-hydrogen lights. The reservoirs are frequently pumped so as to form a vacuum and the air rushes in when the valve is opened, the gas having been all exhausted. 1. When the air ceases to rush in is there 15 lbs. pressure in the cylinder, or after 15 lbs. of gas have been generated is there then 30 lbs. pressure in the cylinder? If the gas should be maintained and gas generated without letting air in the reservoir, must there be 30 lbs. before the gauge will register 15 lbs. pressure? *A.*—Gauges are made to register pressures above the atmosphere which in your case is 15 lbs. above atmospheric pressure. But if the calculations were made from a vacuum or absolute pressure, the pressure under the same circumstances would be 30 lbs. nearly. 2. At what temperature does chloride of potash give off the gas it contains? *A.*—Chloride of potash gives off oxygen at a temperature of about 355° Centigrade (671° Fah.) When heated to about 400° C (752 F.) it is decomposed and at higher temperatures parts with all its gas.

(6) B. C. S., Brockville, Ont., writes: I am having a 13″x 34″ condensing automatic cut-off engine built. The maker says the air pump should be 13″ in diam. and 8″ stroke. I claim that this air pump would be too large. What size would you recommend and what is the effect of having the pump too large? *A.*—The capacity of an air pump should be 1-6 of the capacity of the steam cylinder when single acting. The effect of having it too large would simply be an excessive friction and a loss of the extra power required to work it.

(7) J. A. M., Cleveland, Ohio, asks: What size engine will be required for a flat bottom boat 35 ft. long, 9 ft. beam and drawing 8″ or 10″ of water with side wheels. The engine is to be geared 2 to 1. What diameter of wheel and width of bucket will be required? *A.*—An engine having two cylinders 4½″x 10″. The paddle wheels should be 6 ft. in diameter with a 32″ face.

(8) F. M., East Boston, Mass., asks: Can you tell me how to make a magnet of steel 2″ square and ½″ thick to lift a weight, also how much would it lift? *A.*—Make the magnet of the best steel and temper very hard, polish the face to be used and magnetize it by placing it between the poles of a galvanic battery or a dynamo-electric machine. The amount of weight it will raise depends upon the success of the process of magnetizing the steel.

(9) A. H. T., Newark, N. J., asks: Will you kindly inform me what grade of oil is used by the large screw manufacturers for cutting screws on screw machines, and general screw machine work? *A.*—The best lard oil has been found the most satisfactory on general screw work where it is desirable to maintain accurate standard sizes. On very fine screw work it is necessary to use the best sperm and even finer grades of oil.

(10) G. H. G., Williamsport, Pa., asks: Can you explain the method of charging a horse-shoe magnet so I can separate iron and steel from brass turnings and borings as is used in some shops? I have tried several methods but it don't charge strong enough. *A.*—Hardened steel receives and retains magnetism better than most substances. We therefore recommend that you make a horse-shoe magnet of a good quality of steel and harden it. To charge connect each end with the positive and negative poles of a strong battery. If a dynamo-electric machine is available it will answer the purpose much better than a battery.

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MANUFACTURES.

Hart's File Works, Worcester, Mass., are enlarging.

Ground has been broken at Anniston, Dallas County, Ala., for a cotton factory.

Two miles of shafting will be required for the Cotton Exposition at Atlanta, Ga.

Moulders' strikes still figure as items of news in the daily papers.

Philadelphia is reported to have a hundred new factories in course of erection.

Studebaker Bros. employ 1,000 men at their wagon works in South Bend, Ind.

Workmen are engaged on the new foundry for the Western Railway at Salisbury, N.C.

The Ferracute Machine Co., Bridgeton, N. J., are building a 42-foot addition to their shops.

The King Mountain Mfg. Co., Augusta, Ga., will erect a 30,000 spindle cotton mill. Capital, $750,000.

The Whiteman Agricultural Co., St. Louis, are enlarging their foundry, blacksmith shop, and pattern shop.

A new company has been started in Toledo, Ohio, to manufacture linseed oil. Capital $200,000, all subscribed.

The Lehigh Valley Emery Wheel Company, Weissport, Pa., will build a large addition to their works this season.

Warner & Swasey expect to have their new machine tool works in Cleveland, O., ready for occupancy by July 1.

Coates & Co., Worcester, Mass., are about to build a brick shop 36x50 feet to manufacture horse-clipping machines.

The machine shops of the Eastern railroad will probably be removed to Salem, Mass. They will employ 250 to 300 workmen.

The present capacity of the Baldwin Locomotive Works is ten locomotives a week. They employ 3,000 men.

The old Camden and Amboy shops in Bordentown, N. J.. are to be fitted up by a new company to build locomotives.

Curtis & Co., Saw Works, St. Louis, are about to commence the manufacture of iron working and wood working machinery.

The old car works of Toledo, Ohio, are to be started up by the addition of $200,000 new capital, to manufacture Wilmington's Patent Car Wheel.

The Lowell Machine Shop, Lowell, Mass., will erect a new building, 305x65 feet. They employ over 1,250 men.

The Columbus (Ga.) iron works have lately added largely to their machinery department, and have many new and improved tools.

Montgomery, Ala., is to have a large cotton factory. Considerable money has already been subscribed to the project.

W. F. and John Barnes, of Rockford, Ill., are so driven with orders that they have made arrangements to nearly double their present capacity.

The Cleveland Co-operative Stove Co. are about to erect a new stove foundry and machine shop in St. Louis, to cost $10,000.

Altoona, Pa., is most favorably spoken of as the place of next summer's meeting of the American Society of Mechanical Engineers.

The Daw Agricultural Works, from New York State, are to be located in Peru, Indiana, the citizens of the latter place having raised $10,000 for them as the inducement to move.

The Pelzer Manufacturing Company are preparing to build a cotton mill near the Piedmont Mills, South Carolina. All the machinery has been ordered.

B. Hart & Co., Peoria, Ill., whose shops were burnt in April, are rebuilding on a larger scale. They will be in full operation by May 20th, with 200 men, manufacturing agricultural implements.

Citizens of Fon du Lac, Wis., have organized an association to encourage the introduction of a new manufacturing enterprise, and to promote in other substantial ways the welfare of the city.

Capitalists have subscribed money to establish a cotton factory at Little Rock, Ark., and the contractor has advertised for half a million brick for the erection of the buildings.

The Variety Iron Works Company, Cleveland, have secured more land for the purpose of erecting a large building. They employ 133 hands and report trade good.—*Cleveland Trade Review.*

E. P. Hampson has taken W. F. Harring into partnership. The firm is now E. P. Hampson & Co., 36 Courtlandt St., New York. They have a large supply store for engines, boilers and machinery.

The New Forest City Co-operative Stove Works, Cleveland, O., has completed its organization. The Directors are S. T. Everett, H. L. Melton, George W. Gardner, Charles Strever, Sebastian Zechman George Diehl, and John Flick.

The Globe Company, of Boston, are about to erect locomotive works for building anthracite-waste consuming locomotives, supplied with Berney's straight smoke stack and spark burner and other improvements. The machinery has all been contracted for, and the Globe Company expect to be ready for business in about five months.

The DuBois Manufacturing Company, of Tuscaloosa, Ala., has been incorporated, with $25,000 capital. The company will manufacture gins, furniture, etc.; will saw and plane lumber, and run grist and saw mills.

The Whitehall Sewing Machine Co., has been organized in Milwaukee with a paid up capital of $300,000. They will erect a factory at once and commence the manufacture of sewing machines on a large scale.—*Chicago Industrial World.*

Spring, Robinson & Co., Hyde Park, Mass., manufacturers of paper-box machinery, have recently filled orders for Europe, Canada, Mexico and various parts of the United States. They have just issued a new circular.

Augusta, Ga., has just secured $360,000 for the extension of the Enterprise Cotton Factory at that city. In addition a movement is on foot to build a large new mill and a large extension of one of the older ones is about finished.—*Chattanooga Tradesman.*

The cotton factory to be built at Elberton, Ga., is to cost $35,000, to be run by steam, and the buildings are to be so constructed as to allow of an enlargement. A $50,000 cotton factory is in contemplation in the lower part of Elbert county, and the stock is all taken.—*Chattanooga Tradesman.*

A monster mill is to be built in Minneapolis which will turn out 5½ barrels of flour per minute, 333 barrels per hour, 8,000 barrels per day, 2,400,000 barrels per year (300 days). It will require 10,000,000 bushels of wheat per year to supply it, and the value of its annual product will be at least $14,000,000. It will make one-third of the present wheat crop of Minnesota into flour, and require an army of men to carry on the work growing out of its operations.

The Canadian Locomotive Works has been organized in Montreal, with Geo. A. Kilpatrick, M. P., President; Thomas McGrevy, Vice-President; William Hartley, Managing Director; James W. Pike, Secretary and Treasurer. The Company has acquired the Kingston Locomotive Works, and will enlarge them to the capacity of a locomotive a week, employing between 300 and 400 men. A contract has been made to keep the works busy for some months ahead.—*Railway Age.*

The Ramapo, N. Y. Wheel & Foundry Co. is full of work, having wheel contracts for months ahead, and also for 250 tons of Congdon brake shoes. It is also narrow-gauging a large number of coal, tank and other cars for the New York, Lake Erie & Western. The works are soon to be enlarged by the erection of a new machine shop and an additional foundry.

The Boston & Albany railroad company is putting new and heavy machinery into the car works at Allston, for the purpose of fitting up the new 42-inch paper wheels which are to be used on express trains. The new plant consists of a boring machine lathe and automatic press for forcing the wheels on the axle. These machines are much larger than those generally used for such purposes.

The New York, Lake Erie & Western road is about to erect new shops at Hornellsville, N. Y., including a machine and erecting shop 470x110 feet, a boiler shop 155x80, a blacksmith shop 155x70, a shop for light repairs 100x64, and a number of subordinate structures. The round-house will be 316 feet in diameter, and will have 44 stalls connected with a large turn-table. The specifications call for solid foundations, brick walls trimmed with cut stone, slate roof supported by iron trusses, and heavy oaken floors.—*National Car Builder.*

The Allen Paper Car Wheel Co., Pullman, Ill., have voted to increase their capital stock 25 per cent., making it $1,250,000. Stockholders of record have the option of subscribing for the new stock at par, to the extent of 25 per cent. of their present holdings. This increase is for the purpose of paying for their new paper mills at Morris, Ill., and for otherwise increasing their facilities of business. The unprecedented success of this enterprising young company fully warrants the extensive improvements being made.—*Railway Review.*

The U. S. Circuit Court has recently given a decision in a safety-valve patent case, involving the claims of George W. Richardson and George H. Crosby. Each holds two patents. The questions argued were whether Richardson's patents are valid, and if they are, whether Crosby's patents represent subordinate or independent inventions. The former figures as plaintiff, and the latter as defendant, and the judge gave a lengthy opinion from which we make the following extract: "I understand the resemblances and differences to be these: The defendant, like the plaintiff, employs an additional surface to lift the valve as soon as it begins to blow; and the pressure is regulated, in part, by a stricture. The defendant's valve is unlike the plaintiff's in the following particulars: the additional area is not outside the ground joint, but inside; it is not acted on independently of the valve itself, but is a part of it; the escaping steam does not act at all by impact, but wholly by expansion; the stricture is not variable, opening wider as the power increases, but is adjusted once for all by the operator. Considering the state of the art, as I have found it to be, that Richardson was not the first to invent and apply, more or less well, the principle of the additional area, nor that of the stricture, he could not, whatever the words of his claim, successfully enjoin the use of a valve resembling his own only in its adoption of these general ideas. I am of opinion, then, that Richardson neither claims, nor could properly claim, a valve having such a mode of operation as I find in this valve of the defendant."

Machinists' and Engineers' Supplies.

New York, May 5, 1881.

The supply market continues same as reported last week.

The steam gauge and railway supply business established by E. H. Ashcroft in 1851, in Boston, and now owned and controlled by the Ashcroft M'f'g Co., has passed into the hands of the following named gentlemen: E. L. Maxwell Prest., C. A. Moore V. Prest., H. S. Manning Treas., M. Luscomb, Sec'y. The factories of the Co. will continue to be located at Boston and Lynn, and the financial office and salesroom at 111 Liberty Street, New York City. They are obliged to largely increase their facilities for meeting the demands of their trade.

Notice.

We have this day taken Mr. Chas. A. Moore, of Boston, into partnership and change firm name to Manning, Maxwell & Moore. The accounts of H. S. Manning & Co., will be settled by the new firm.

H. S. Manning. } H. S. Manning & Co.
E. L. Maxwell. }

New York, May 2, 1881.

Iron and Metal Review.

Business in Pig iron both in domestic brands and Scotch is restricted to small lots. Prices are not strong. Quotations, No. 1, $24 to $25; No. 2, $22; Grey Forge, $20; Coltness, $23.50 to $24; Eglinton, $21.50 to $22; Glengarnock and Gartscherrie, $22.50 to $23. Rails are unchanged. Wrought scrap is in diminutive demand at $28 to $29 for No. 1 from yard. Boiler Makers supplies are in fair demand for immediate use. Logically prices should have advanced by this time and every one is surprised that they have not. Large production and backwardness of season have kept market low. The outlook however is good. We quote:

Tank, 2¾c. to 2¾c.; Refined, 3c. to 3¼c.; Shell, 3⅛c. to 3¾c.; Flange, 4½c.; Extra Flange, 5⅛c. to 5¾c. Bar Iron from store remains on a basis of 2.4c. to 2.5c. for Refined.

The metal market is more active. Ingot copper sells at 18⅞c. to 19c. for lake. The English market is reported steady by cable. Tin is firm at 20¼c. for Straits and 20¼c. to 20⅝c. for Refined English. Refined Lead is held at 4⅝c. to 4⅞c. and Common at 4c. to 4¼c. Domestic Spelter is dull at 4⅞c. to 5c. and Silesian, 5¾c.; Sheet Zinc sells at 7c.; Antimony is steady at 14½c. to 15c.

WANTED

An experienced and reliable Practical Mechanical Engineer and Draughtsman desires charge of machine works. Address I. Wadsworth, No. 76 Second St., Brooklyn, E. D.

Wanted.—Foreman for machine shop doing a general business. He must be an energetic and thorough mechanic. Eagle Iron Works, Des Moines, Iowa.

Wanted—Machinists—A few strictly first-class vise and floor hands, capable of fitting up the heavier class of machine tools, such as Boring Mills, Planers, Axle Lathes, Driving Wheel Lathes, Car Wheel Borers, Engine Lathes, &c. Only thoroughly competent and experienced men need apply, we want no other kind. To such we will give *steady employment at the highest wages.* Hamilton is a suburb of Cincinnati, connected by telephone and 30 daily trains, living cheap, location healthy, and a particularly desirable place of residence for married men. Applicants will please state how long they have had experience building machine tools and in what establishments, and what wages are expected. Address or apply to Niles Tool Works, Hamilton, Ohio.

Wanted.—Foreman for a jobbing shop; a man of good temperate habits that can handle twenty men to good advantage; must have a good general idea of repairs; good wages to a suitable man. Address, "Jobber," care Letter Carrier No. 13, Cleveland, O.

Wanted.—Situation as draughtsman and foreman in Railroad shop. Thoroughly acquainted with the ordinary eight wheel, Mogul and Consolidated types of engines. Also car work. Filling a similar position at present. Reference present employers. Sutherland, care American Machinist Office.

Machinists Wanted.—Two or three men to work on fine finishing and fitting on our iron planer and shaper work. Steady Employment given to sober industrious men. Those unwilling to name wages wanted need not apply. The Hendey Machine Co., Torrington, Conn.

First class machinist, understanding printing press machinery and capable of superintending a shop, may address, with references, Manufacturer, care, American Machinist, New York.

An experienced Pattern Maker wants a situation. Distance no object. Address, Patterns, American Machinist Office.

Wanted.—By a competent and reliable engineer, a situation. Is American, middle age, 10 years practical experience, strictly temperate. Parties in want of a first rate engineer. Address, for full particulars, W. F. Sage, Box 648, Milford, Ct.

Wanted.—A young Swede, graduated from Technical High School, and who has worked about three years in foundry and in machine shop, desires a position as draughtsman. Address Y. Z., Holyoke, Mass., Box 789.

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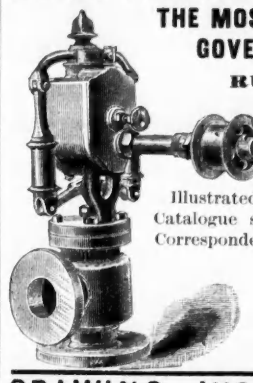

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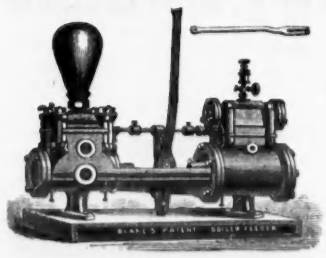

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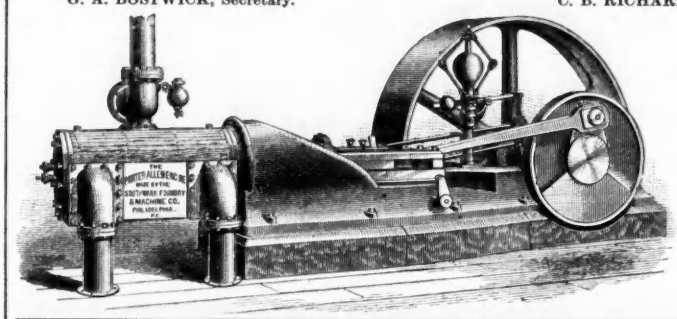

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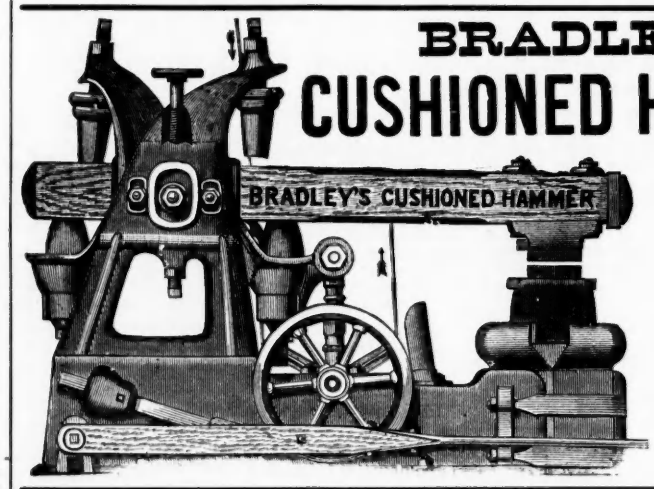

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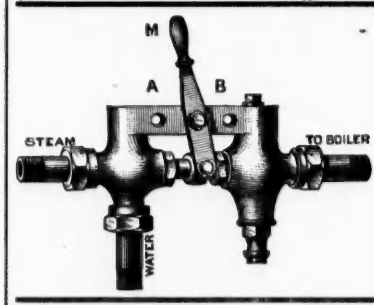

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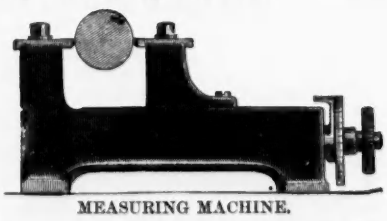

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